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INDIA RUBBER WORLD

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Volume 98 | August 1, 1938 | Number 5

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Published monthly by Bill Brothers Publishing Corp., 420 Lexington Ave., New York, N. Y. Cable Address, ELBILL, New York. Subscription $3.00 per year postpaid in the United States and Mexico; $3.50 per year postpaid to Canada; $4.00 per year postpaid to all other countries.

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INDIA RUBBER WORLD

Published at 420 Lexington Avenue, New York, N. Y.

Volume 98 | **New York, August 1, 1938** | **Number 5**

Pneumatic Tires—I

A Chronicle of Interesting Happenings in the Early Days of the Casing Industry

Ralph F. Wolf[1]

CENTURIES before the picking of the daily double in the chariot races at the Coliseum Track became a favorite pastime of decadent Rome, man knew the convenience of the rolling wheel. Back at the very verge of history, the root word for wheel was common to every Aryan tongue. How many ages earlier it was when one of our brighter ancestors first hewed a round section from a tree trunk and with sharp stone whittled it out between the ends to make himself a set of wheels cannot be determined. We do know that for centuries man was content to jar his bones as, first, his solid wooden and later his iron shod wheels rolled heavily over Mother Earth. We also know that it has been little more than a hundred years since he first tried to soften his clangorous progress by riding on soft, yielding rubber.

Robert William Thomson, 1822-1873, Who Invented the Pneumatic Tire in 1845

As early as any of the written references, perhaps, is the one contained in an 1833 letter[2] by M. Barbier, who started France's second rubber factory, the company that later became Michelin's. He lists a number of uses for rubber, particularly "protection for the wheels of light vehicles." This application of unvulcanized rubber could not have been very successful, but with the discovery of vulcanization in 1839, the hunch again was worthy of consideration although Charles Goodyear was blissfully ignorant of the fact. In 1857, his great rival, Hancock recalled[3]:

"During 1846, we made . . . solid rubber wheel-tires. . . . These tires are about an inch and a half wide, and one and a quarter thick. Wheels shod with them make no noise, and they greatly relieve concussion on pavements and rough roads; they have lately been patronized by Her Majesty."

This almost certainly was not the first use of the vulcanized solid rubber tire, for Hancock made no claim to its invention and he was by no means a modest man.

Thomson Invents Pneumatic Tire—1845

Identity of the first person to see that riding on air would be softer than riding on solid rubber is a matter of record. In the County of Middlesex, England, young Robert William Thomson, civil engineer, first thought of wrapping springy air with a rubber tube. Thomson not only thought of the idea, but carried it out. He lived before his time, for the rubber industry, just entering the era of commercial vulcanization as he was granted his patent, was unable to build a really satisfactory product to his specification. Thomson was born in the Market Square, in Stonehaven, Kincardineshire, Scotland, June 29, 1822. He was destined for the ministry, but early expressed such a hatred for Latin that it became evident he was not fitted for the career his parents had intended. It was equally obvious that science was to be his future mistress. An old ball from the gatepost of a farmhouse served him as a globe for the study of astronomy. Other rough appliances made

[1] With B. F. Goodrich Co., Akron, O.
[2] Quoted in "The World on Wheels," by R. O. Duncan, Paris, 1926.
[3] "The Origin and Progress of the Caoutchouc Manufacture in England," by Thomas Hancock, London, 1857.

in his home workshop and the advice of a mathematically inclined weaver of the town aided him in conceiving a number of the ideas which later made him world known as an engineer. At fifteen, the youth was sent to Charleston, S. C., U.S.A., to be educated in mercantile pursuits, but this suited him no better than the ministry, and it was not long until he was back in Scotland. Allowed to go his own way at last, his love of engineering sent him into the workshops of Aberdeen and Dundee. From the shops he went into the office of a civil engineer where he distinguished himself almost immediately by devising a method of firing mines by electricity, a practice which was universally adopted with a resulting great saving of life. This success led Thomson into an important engineering appointment at Dover and from this into the employment of the great railway engineers, the Stephensons. In 1844 he began business as a railway engineer on his own account, but this enterprise was scarcely begun before it was ended by the panic which followed the period of railway mania. Again Thomson turned his mind to invention. A glance at the patent[4] granted this 23-year-old stripling on December 10, 1845, shows him certainly to be the originator of the pneumatic tire.

"The nature of my invention," stated Thomson's patent, "consists in the application of elastic bearings around the tires of the wheels of carriages for the purpose of lessening the power required to draw the carriages, rendering their motion easier and diminishing the noise they make when in motion. I prefer employing for the purpose a hollow belt composed of some air and water-tight material such as caoutchouc or gutta-percha and inflating it with air, whereby the wheels will, in every part of their revolution, present a cushion of air to the ground or rail or track on which they return."

And today's rubber man likes to think that the rubber-tired rail car is excessively modern!

Thomson made the elastic belt by cementing together a number of folds of canvas which had been saturated with rubber solution. This belt was, according to the patent, "sulphurized by immersion in melted sulphur or exposure to the fumes of burning sulphur . . . and then enclosed in a canvas cover. A strong outer casing in which to hold the elastic belt is then built up around the tire [tire at this time meant the outer rim of the wheel] by rivetting together a series of circular segments of leather and bolting them to the tire. The segments at two of their edges are made to overlap each other and then secured in their place by passing bolts through the tire and felly. . . . The elastic belt is then laid upon the portion of segments, thus made fast to the tire, and secured in its place by bringing the two remaining and as yet, unjoined edges of the segments together over the casing and connecting them together by rivets. A pipe through which to inflate the elastic belt with air is passed at one place through the tire of the wheel and fitted with an air tight screw cap." Thomson also suggested filling the "elastic belt" with pieces of sulphurized caoutchouc, sponge, or horsehair—foreshadowing the "puncture proof" tubes of a later date. The patent additionally covered the application of elastic belts to "bath chairs, rocking chairs and other articles used commonly either in pleasure grounds or within doors." Thomson was granted a patent for his tires in France in 1846 and in the United States in 1847, much to the sorrow of geniuses who had applications thrown out several decades later on the grounds of anticipation.

Use of First Pneumatic Tires

A number of the tires were made for coach tests in London and placed in service March 17, 1847. One set was supplied by Messrs. May and Jacobs, of Guildford, to Lord Lovaine at Albury Park and was fitted to his brougham. The transaction as recorded in the May-Jacobs account book for October 1, 1847, included payment of £42 2s. for "Putting a new set of Aerial Wheels" and of 12s. for "Brass condenser for ditto," the latter item referring to a tire pump. Apparently the Aerial Wheels were not blowout proof, or else Lord Lovaine had a puncture, for on November 4 appears the entry: "2 Journeys to Albury to take off and refix Aerial Wheel, 10s." The size of Thomson's tires, as well as their noiselessness, attracted attention. Those for a brougham were five inches in diameter of the cross section. A contemporary issue of the *London Mechanics' Magazine* mentions that a set of these tires ran 1,200 miles without the "slightest symptoms of deterioration or decay." There are other casual references to the noiseless tires, but they never amounted to more than curiosities which caused considerable merriment and then were forgotten. Very likely they were too frail for the rough English roads of the time, and the repair of the elastic belts, when punctured, must have offered considerable difficulty. Convinced of the feasibility of the idea, Thomson continued to bother the manufacturers for satisfactory air tubes even while he was being forced to turn back to the solid tire through their inability to supply what he wanted. In 1851 at the Great Exhibition of London, he displayed an invalid chair regarding which the exhibition catalog stated, "The wheel (in addition to an iron tire) is shod with a solid band of vulcanized India-rubber said to be as durable as iron."

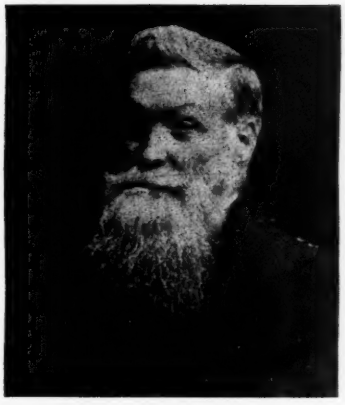
From this, Thomson turned his attention to developing the steam tractor. The "Ravee," which he sold to the Indian Government in 1865, had solid rubber tires, and this is reputed to have been the first successful attempt to apply a rubber tire to a heavy mechanically propelled vehicle. By 1868 Thomson's five-inch-thick solid tires for steam traction engines were known all over Europe. In that year the North British Rubber Co. produced for him the Goliath of all solid tires that ever existed, either before or since. These tires, weighing 750 pounds apiece, were six feet in diameter, fifteen inches wide, and five inches thick. The Indian Government heard of the marvelous hauling power of the new tractor and sent Captain R. E. Crompton home to arrange with Thomson for the supply of a fleet of "road locomotives fitted with elastic tires." Crompton found the inventor an invalid confined to his sofa. In a contribution to *The Engineer*[5] Crompton relates:

"During the time I was working in Thomson's room, he gave me the whole history of his ideas on road locomotion. In 1845 he had taken out a patent for air cushion tyres, which disclosed in every important particular the present pneumatic tyre which was reinvented many years later by Dunlop. . . . In the years immediately following the taking out of his patent he had fitted a number of horse-drawn vehicles with these pneumatic tyres, and the results were marvelous as regards the increase of comfort of riding in the vehicle; and he had then been much struck by the fact that these pneumatic tyres 'absorbed the obstacle,' the phrase so often used by Michelin in his early advertising. . . . Thomson told me that for many years he tried to obtain from the rubber manufacturers the impervious air-tight inner tubes he required, but that up to the year 1866 he was unsuccessful, so that when he required machinery for the Labuan coal mines he began to experiment with solid rubber of great cross section in order that he might get approximately the same results

[4] British patent No. 10,990.
[5] June, 1922.

as he obtained with the pneumatic arrangement; but in 1870, the North British Company, although it manufactured splendid tyres of huge size, would not guarantee the air-tightness of the inner tubes for the pneumatics which Thomson required."

Americans, during this period, were doing little to advance the use of rubber tires on vehicles. Two young Boston mechanics, George Souther and George H. Miller, in 1856 had the Boston Belting Co. make them a long square strip of solid rubber which they fitted into channels in buggy wheels. The first tires were so soft that they flew from the channel when driven fast. The next set was harder and more successful. Greatly pleased, the inventors were about to take out a patent. In stepped Robert Taylor, Cambridge chief of police, warned them that the running of a vehicle so equipped was a nuisance because people could not hear it approach, scared them out of making further use of their idea.



John Boyd Dunlop, the Scotch Veterinary, Who Reinvented the Pneumatic Tire in 1888

The Development of the Bicycle

It was not due to the buggy, but to the bicycle that rubber tires owed their initial development. To Baron von Drais de Sauerbon goes credit for the invention, in 1818, of the two wheeled velocipede with a front steering wheel. This contraption, long known as the "dandy horse" because commoners could not afford it and its use was restricted to "dandies," was propelled by means of the rider straddling the machine and striding along until he had attained sufficient speed to coast for some distance. First to fit cranks and pedals to the "dandy horse" was Ernest Michaux, native of Bar-le-Duc in Lorraine. Michaux worked out this revolutionary idea at the suggestion of his coachbuilder father, Pierre. One day in 1861 a customer brought in a machine to have a wheel repaired. Having completed the work, Ernest tried it out and reported that it was very tiring to hold his legs up while coasting. Papa Pierre suggested a foot support at the front fork or, better still, a crank so that he could make the wheel revolve as if he were turning the handle and crank of a grindstone.

The new device greatly increased the popularity of the cycle. The machine was now much speedier and soon earned the well-deserved name of "boneshaker." The necessity of reducing the vibration of the wheel turned the thoughts of Thomas Sparrow, London salesman, to the possibility of putting rubber tires on the successor of the "dandy horse," and about 1870 he introduced the idea commercially. The English were too busy building empires to pay much attention to Sparrow at first, but by 1873 he had won a following and financed a great thousand mile run from Land's End to John o'Groats. Four riders made the trip; the best record was fourteen days. Sparrow rode a wheel himself over most of the route to discover the weak points of his machines. Noticing that the rubber tires skidded on wet clay roads, he made experiments resulting in the use of leather treads and of corrugated rubber treads.

Dunlop Reinvents Pneumatic Tire—1888

The '70s were the period of the "ordinary" and its huge front wheel; the late '80s of the low or "safety" rear driven machines on modern lines; the '90s of free wheels, variable gears and most important, the pneumatic tire. Several short-lived cycle crazes there had been, notably in the '60s. It is to the reinvention of the pneumatic that we owe the American and English craze of the '90s, a period attended by such phenomena as the "Century run," the bloomer girl, and that then popular song about Daisy Bell honeymooning "On a bicycle built for two."

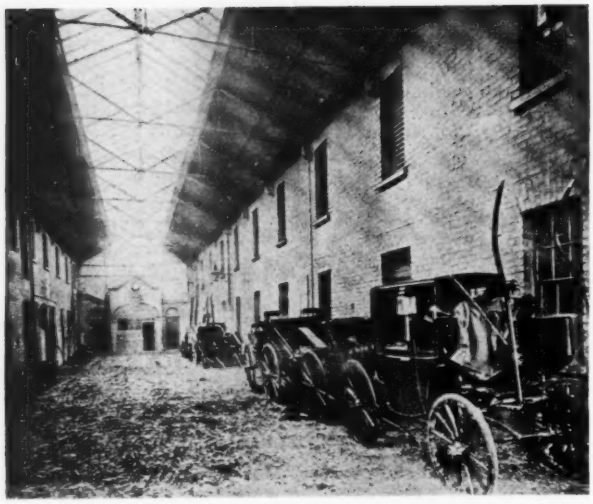
Oddly enough, it was a horse doctor—and a Scotch one at that—who repeated the Thomson discovery and first put the horse against tough competition. John Boyd Dunlop was the man, and the name today graces Britain's dominant rubber manufacturing company. Dunlop was born at Dreghorn in Ayrshire, February 5, 1840. Although physically frail as a boy, he was an excellent student, so apt that schoolmaster M'Gavin of the Dreghorn Parish School set him to teach the younger pupils mathematics. The youth continued his schooling at Irvine Academy under a Dr. White and then entered the University of Edinburgh, graduating with a veterinary surgeon's degree when only nineteen. Three years later he went to Belfast, and by 1888, the year he invented his tire, he had built up the most extensive veterinary practice in Ireland, employing twelve horseshoers and doing a considerable business in the sale of medicines. In "The History of the Pneumatic Tyre," which he was writing at the time of his death in 1921, Dunlop recorded:

"As long as I can remember I have taken an interest in locomotion by road, rail and sea. Like many others I entertained the idea that spring wheels with flexible rims would run lightly on the road, because the area of the portion of the rim resting on the road being large, the pressure per unit of area would be small. The wheel would, therefore, bear on the road surface gently and softly, and the shock or vibration when mounting obstacles would be intercepted at its source before it reached the wheel or the axle.

"For a period of twenty years or more, I occasionally thought of various forms of spring wheels. At one time I entertained the idea of a flexible band of steel running at each side of a horse drawn vehicle, with a number of wheels or rollers supporting the vehicle and bearing on the steel band underneath. However, I made no actual experiments relating to spring wheels, as I was convinced that no steel band could be obtained which would long withstand constant bending on the road without becoming fatigued and crystallised.

"Having abandoned the idea of spring wheels, it occurred to me that the problem of obtaining speed or ease of propulsion of vehicles, might be solved by a peculiar mechanical arrangement of cloth, rubber and wood. At length, it dawned on me that the problem as to light vehicles, at any rate, might be solved by means of a triple tube of rubber, canvas and rubber distended with compressed air. These are some of the ideas, which after being considered from time to time led up, eventually, to the invention of the pneumatic tyre.

"I never entertained the idea of a rigid rim suspended or supported by springs interposed between it and the hub, because such a rim without the support of rigid spokes, would require to be made heavier than an ordinary wheel. There would, therefore, be no saving of weight in the vibrating part, nor reduction of pressure on the road per unit of area."



Dunlop's Stable Yard in Belfast Where the First Tests on a Pneumatic Tire Were Carried out at Night in order to Keep the Idea a Secret

At this time the solid rubber tires used on ordinary bicycles, or "roadsters," were an inch thick and were heavy and slow on good or average macadamized roads although they were comfortable when used on the block pavements found in cities. Tires used for racing were narrow ribbons three-eighth-inch thick and looked like bootlaces. These were fast on smooth roads, but impractical for use on rough pavings. The problem which Dunlop set himself to solve was to make a tire that was large, in order to overcome vibration, and yet fast on all surfaces. Toward the end of October, 1887, he carried out an experiment that was destined to have far reaching effects. He made a disk of wood, sixteen inches in diameter, and with thin sheet rubber constructed an air tube. He was used to working with rubber as he made his own veterinary gloves and other rubber articles which he used in his profession. Dunlop wrote[6] of this development:

"There was no tubing to be had of the kind I wanted, so I got a sheet of rubber and some solution and made a tube for myself. . . . Presently I had an air tight tube around my wheel with a bit of the tubing of a baby's feeding bottle sticking out for a valve. . . . If I had pumped air into it in that condition, it would have blown out like a balloon until it burst. I appealed to my wife. Fortunately she had exactly what I wanted. She got me a strip of an old dress of fine grey linen that had been fashionable in its day. A strip of this linen I pressed over the rubber tube and tacked it neatly and tightly to the wooden wheel. Then I pumped the air in with my boy's football pump, folded and tied the end of the bit of feeding bottle tubing."

The first test was carried out at night in the yard of the veterinary premises as Dunlop was anxious to keep the idea as secret as possible. At the close of business the large gates were locked. There were only about six people present, including the Dunlop family. The inventor took the air-tired wheel and the front wheel from his son's tricycle into the yard and asked his assistant, John Caldwell, which he thought would be faster. Caldwell thought the solid tire, being smaller, would likewise be the speedier. His master then threw the solid tired wheel along the yard, but it did not travel the full length. The air tire, thrown with the same force, traveled the full fifteen yards and bounced back from the gate. Unconvinced, Caldwell tried the experiment himself with the same results. Dunlop knew now that he was on the right track. So did his ten-year-old son, Johnny, who immediately started to campaign for a set of the tires so that he could beat the boys with whom he raced in People's Park.

Before the end of December, 1887, the horse doctor procured two strips of American elm which he fashioned into three foot wheels. The air tubes were made of the finest and thinnest sheet rubber he could buy. Each air tube was drawn into a canvas tube, a small air supply tube inserted, and the ends of the air tube cemented together. The valve was of the simplest type, being a strip of rubber secured across the inner end of the air tube, thus forming a non-return valve. The canvas cover was made in two pieces in the form of a tube with flaps. The flaps were cemented to the rim, the entire jacket covered with a sheet of rubber, and two additional thicknesses of rubber were cemented to the tread. The tires and rims were completed and fastened with copper wire to the rear wheels of Johnny's tricycle late in the evening of February 28, 1888. Unable to wait until morning, Johnny pedaled out into the streets of Belfast about 10 o'clock. His speed trials were interrupted by an eclipse of the moon which sent him scurrying home, but when the shadow passed, he was again out for another sprint. The report of this first test was that the tricycle was fast on all surfaces, and examination the following morning revealed no signs of wear or damage.

Dunlop's next step was to order a new tricycle without wheels from W. Edlin & Co., Belfast. He then proceeded to make some extra-large wheels in order to gear up the machine and take advantage of the lessened resistance. The completed cycle proved so satisfactory that Dunlop applied for a provisional patent[7] on his pneumatic tires on July 23, 1888. This preliminary specification merely described the invention as: "A hollow tyre or tube made of India-rubber and cloth, or other suitable material, said tube or tyre to contain air under pressure or otherwise and to be attached to the wheel or wheels in such method as may be found most suitable." His completed specification, which was filed November 2, 1888, went into a

(*Continued on page* 45)

Dunlop's Ten-Year-Old Son, Johnny, Mounted on the First Bicycle ever Fitted with Pneumatic Tires; This Machine Won for Itself the Popular Name of "Mudcart"

[6] *India Rubber J.*, June 9, 1902. p. 577.
[7] British patent No. 10,607, granted Dec. 7, 1888.

Neoprene and Rubber Stoppers for Lyophile Serum Containers

The Relative Permeability of Neoprene and Rubber to Air and Moisture

Earl W. Flosdorf and G. W. Webster[1]

THE lyophile process of drying from the frozen state gives promise of wide application in biological industries. It is being used in more than 100 laboratories throughout the United States and also in Europe and South America. Commercial adoption is now in process. Heretofore scientific literature has been concerned with the absorption of water vapor by rubber and Neoprene rather than permeability. This discussion of the relative effectiveness of rubber and Neoprene and the type of stoppers most suitable should be of practical value to this new industry and of basic interest to rubber chemists and the rubber industry in general.

RUBBER is not the ideal material to prevent diffusion of air and moisture, and the properties of Neoprene[2] in this respect are not well known quantitatively. The preservation of therapeutic sera and other biologics by the lyophile process, for human injection, has introduced the problem of storage of the product in a package which will be convenient for the physician and which will also meet the rigid requirements necessary for protection of the product. The lyophile process is one of rapid drying from the frozen state after initially freezing the product rapidly at —50° C. or lower.[3] An ideal means for introduction of sterile water aseptically into the evacuated container is to use a rubber stopper which can be pierced by the needle of the physicians' syringe. During the storage in such a container it is the stopper, therefore, that is relied upon for protection of the product. It has seemed advisable to investigate the relative permeability of rubber and Neoprene and the influence upon this permeability of other constituents compounded with them. We have been able to determine quantitatively the limitations of the various stocks with respect to adequate protection of the dry biologics over extended periods of storage.

Inasmuch as both air and moisture are factors in the deterioration of some biologics, the permeability to each must be considered. The rates of permeation of air and of moisture cannot be expected necessarily to be parallel. The dried serum products are extremely hygroscopic, which will maintain the pressure of water vapor in the interior of the container at a very low level and which will tend to increase the relative rate of permeability of water vapor. On the other hand the mechanism of permeation of air through rubber is largely diffusion, but in the case of moisture it is probably both diffusion and dissolution; the latter mechanism depends on the hydrophilic properties of the rubber. The hydrophilic properties of Neoprene might be expected to be less marked than those of rubber. Furthermore, since the time that the present investigation was undertaken, Starkweather and Walker have published data which indicate that certain Neoprene stocks offer a much greater resistance to water *absorption* than do rubber stocks.[4] Neoprene might exhibit, therefore, greater preferential resistance to moisture permeation compared with air than does rubber.

The dried serum in practical use may be subjected to storage under a wide range of conditions of temperature and relative humidity. In the tropics the containers of dry serum may be exposed to a high temperature at high relative humidities. In other regions the temperature may be high, but the air very dry. Furthermore the relative effect of the two factors upon deterioration of biologics varies. It has been essential, therefore, to determine quantitatively the degree of permeability of rubber and Neoprene to air and to moisture under a wide variety of conditions.

Experimental Procedure

With the cooperation of The West Co., Philadelphia, rubber and Neoprene were each compounded with different types of filler and made into stoppers. The Neoprene stocks were prepared according to formulae recommended by The West Co. after it had consulted with a representative of E. I. du Pont de Nemours & Co., Inc., Wilmington, Del. The various stock compositions are shown in Table 1.

Storage of serum at elevated temperatures (37 to 50°C.) in this laboratory, where the normal temperature

---

[1] Department of Bacteriology, University of Pennsylvania School of Medicine, Philadelphia, Pa., and Mulford Biological Laboratories, Sharp and Dohme, Glenolden, Pa.

[2] E. R. Bridgwater, *Ind. Eng. Chem.*, 28, 394 (1936); *Ind. Eng. Chem. (News Ed.)*, 29, 43 (1937).

[3] J. Reichel, U. S. patent, No. 2,066,302, Dec. 29, 1936.

[4] H. W. Starkweather and H. W. Walker, *Ind. Eng. Chem.*, 29, 1380 (1937).

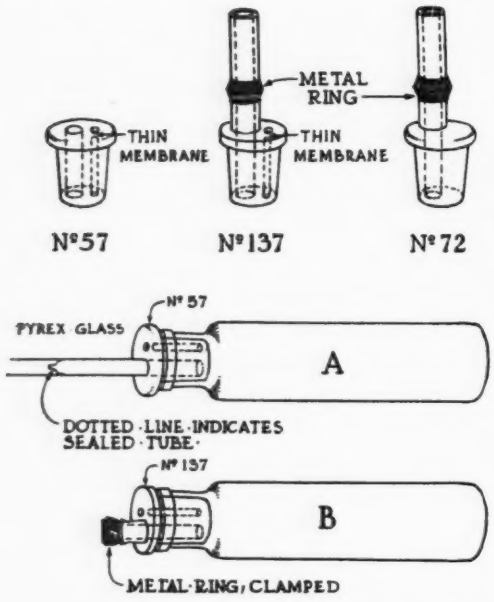


Fig. 1. Containers and Stoppers

A. Glass sealing tubes through stopper No. 57. B. Integral rubber tubing extension on stopper No. 137 is sealed by the metal ring clamp

is 20 to 30° C. and the relative humidity varies from 20 to 90%, gives rise to a variety of conditions, usually fairly dry. The conditions are dry at the artificially elevated temperatures even in the summer when the outside air is at a high relative humidity.

To meet the wider range referred to above the tests were carried out under two sets of conditions of relative humidity. The first was under the varying conditions produced by the seasons in controlled temperature vaults and will be referred to as "normal relative humidity." The second was close to saturation. The "saturated" condition was established by placing numbers of containers in large sealed jars; the bottoms of the jars were covered with a thin layer of water. Jars were placed at three temperature ranges, 20 to 23° (underground vault), 36 to 38°, and 45 to 50° C. At the "normal" humidities storage was carried out at 2 to 4° C. in addition to the above three temperature conditions. The actual "normal" relative humidities, as measured by wet bulb depression, are shown in Table 2. In addition a numbeer of containers were stored under water at 37° C.

In all of this work 25 ml. containers were used. Preliminary experiments were carried out with necks of different dimensions in order to determine the optimal relation of size of neck to size of stopper.

Table 2. Variation of Relative Humidity with Temperature under the Controlled "Normal" Conditions of This Investigation

Temperature °C.	Relative Humidity %
2 - 4	50 - 70
20 - 23	50 - 90
36 - 38	20 - 37
45 - 50	8 - 15

For air permeation a large number of stoppered empty 25 ml. glass containers were evacuated and then sealed under vacuum.[5] The air leakage was determined during storage, initially at weekly intervals, later at monthly intervals, as follows. Water from a syringe was allowed to be drawn into the container by the remaining vacuum; the volume of water thus drawn in was recorded. The container was then opened, and the volume of water necessary to fill it completely was measured. From these values was computed the "percentage of vacuum remaining." This procedure eliminates errors in computation from slight variation of container size. Two containers were opened thus at each interval, and the average results obtained after various intervals were plotted against the duration of storage; the curves obtained were all smooth indicating gradual and progressive changes which are reproducible.

In the determination of permeation of moisture the same style of containers was used; 10 ml. of normal horse serum had been dried in each of these by the Lyophile process in the Flosdorf-Mudd apparatus.[5] At the end of the process the containers were sealed with the contents maintained in vacuo. Containers were opened at intervals in order to make moisture determinations by the method of Flosdorf and Webster.[6] The results have been plotted in Figure 2.

The stoppers used are illustrated in Figure 1 and are of the following description:

No. 57, a stopper with a hole for the glass exhaust tube which is sealed by fusion, and a thin membrane section for piercing with a syringe needle.

No. 137, the same as No. 57 except that it carries an integral rubber tubular extension, to be sealed with a metal clamp, in place of the hole for glass tube. This rubber tubular extension provides a considerable area of thin rubber which offers little resistance to permeation.

No. 72, the same as the No. 137 except that it has no special thin membrane section for piercing with a syringe needle. The tubular extension below the metal clamp is used for this purpose.

No. 73, the same as No. 72 except of small dimensions for smaller container with very small necks.

Results of Tests

Leakage through the clamped end of the No. 137 stoppers (and other tubular types), had it occurred, would have invalidated conclusions concerning permeation; such leakage, however, has been found to be negligible. This

[5] E. W. Flosdorf and S. Mudd, *J. Immunol.*, 29, 389 (1935).
[6] E. W. Flosdorf and G. W. Webster, *J. Bio. Chem.*, 121, 353 (1937).

Table 1. Composition of Stocks*

(Parts per hundred)

	100	66F	39B	127†	75G	96	141	141A	141B	142	143	144
Rubber	95	51	45	61	0	33.5	36.1	36.1	35.1	0	32.5	66
Neoprene	0	0	0	0	51	0	0	0	0	81.3	0	0
Sulphur, accelerator, etc.	5	2.5	2	1	0.5	3.63	11.19	14.19	15.19	2.42	3.63	4
Barium sulphate	0	40	0	34	0	56.25	0	0	0	0	54.25	0
Clays	0	0	46	0	16	0	44.71	44.71	44.71	12.21	0	0
Vulcanized rape seed oil	0	0	0	0	0	5.62	4	4	4	0	5.62	0
Paraffin	0	0	0	0	0	1	0	0	0	0	1	0
Resin	0	0	0	0	0	0	4	1	1	4.07	0	0
Gutta percha	0	0	0	0	0	0	0	0	0	0	3	30
Other fillers	0	6.5	7	4	32.5	0	0	0	0	0	0	0
Degree of hardness	soft	soft	very hard	hard	hard	soft	veryhard	hard	soft‡	soft	soft	soft

*Information supplied by The West Co.
†Fast cure.
‡Too soft to use.

was determined by coating with Picein cement, first, the end of the cut tubular extension up to and including the clamp; second, the entire tubular extension; and third, the entire stopper. The results are tabulated in Table 3. Permeation is appreciably retarded only when the entire tubular extension is coated, and further retardation is not appreciable even if the entire stopper is coated. Furthermore, when the metal clamps are removed from the uncemented tubular extensions after a period of several weeks, it is found that the rubber and Neoprene tubing has been sealed by "vulcanization." Any small amount of error that might be introduced in this way in comparing the various gums is reduced to a negligible value because all of the gums have been treated under identical conditions.

TABLE 3. AIR LEAKAGE THROUGH TUBE-STOPPERS STORED AT 3°C.

Stopper*	Storage Period Months	Vacuum Remaining: Picein Cement: None %	Tips Only %	Tips and Tubes %	Entire Stopper %
No. 73†.....	2	66	69	81	81
No. 73†.....	4	55	53	63	65
No. 137.....	4	87	..	94	..

*No. 66F stock.
†The containers into which stoppers No. 73 were inserted are 2 ml. in volume. This increases the proportional loss in vacuum which is due to air dissolved in the rubber.

The results obtained with small ampoules, the bodies of the stoppers of which were pierced with a syringe needle, have given a further indication of the property of the rubber which causes it to seal itself. The results show that the compression of the rubber within the necks of the containers was sufficient to seal the hole and maintain the vacuum during the storage period as well as if the stoppers had never been pierced.

Since the leakage through the cut end of the extensions on the stoppers is at the most relatively small, the permeation through a unit area of rubber 2 mm. thick may be calculated as a first approximation. The amount of moisture and air passing through the body of the No. 137 stopper has been determined with stopper No. 57, and in this way the permeation through the tubular rubber extension of the No. 137 can be calculated. The actual volumes of water, calculated as vapor at standard conditions (760 mm. of Hg and 273°A.), passing through a unit area of the tubular extension of certain of the stocks, have been plotted in Figure 2 and compared with air permeation. These results cover a six-month period under the various conditions of storage. The curves show that the permeation of air is definitely less than that of moisture under all conditions, with all the rubber stocks and with Neoprene. The degree of permeation to moisture is dependent on the relative humidity and on the temperature. At saturation the temperature coefficient of permeation to moisture is exceedingly high.

The permeation of air and moisture through the stocks not included in Figure 2 in every case falls within the limits of that for the two extremes illustrated in Figure 2. It is evident, therefore, that the composition of the stocks does influence the permeation, but not to the extent that might have been expected. Furthermore the effect of changing from rubber to Neoprene is of even smaller magnitude than changing the other components, except in the case of air permeation. These observations are not inconsistent with the results of Starkweather and Walker[4] who showed considerable influence of other ingredients, particularly rosin (as in our No. 142 stock), upon the water absorption of Neoprene. They showed that the absorption is rapid in the initial stages. In our experiments, where a large differential in vapor tension on the two sides of the membranes is being maintained,[7] it is not inconsistent to obtain similar rates of permeation even though within certain limits the equilibrium concentration of water within the membrane varies.

In the case of air Neoprene exhibits greater resistance

[7] Although no determinations of vapor pressure have been made, the hygroscopic effect of the Lyophile normal horse serum is evident by the observation that its moisture content will be increased by as much as 1% of its weight in one minute when exposed directly to a relative humidity of 68% at 25° C. (Reference, footnote [4].) This rate may be taken as a qualitative indication of low vapor pressure.

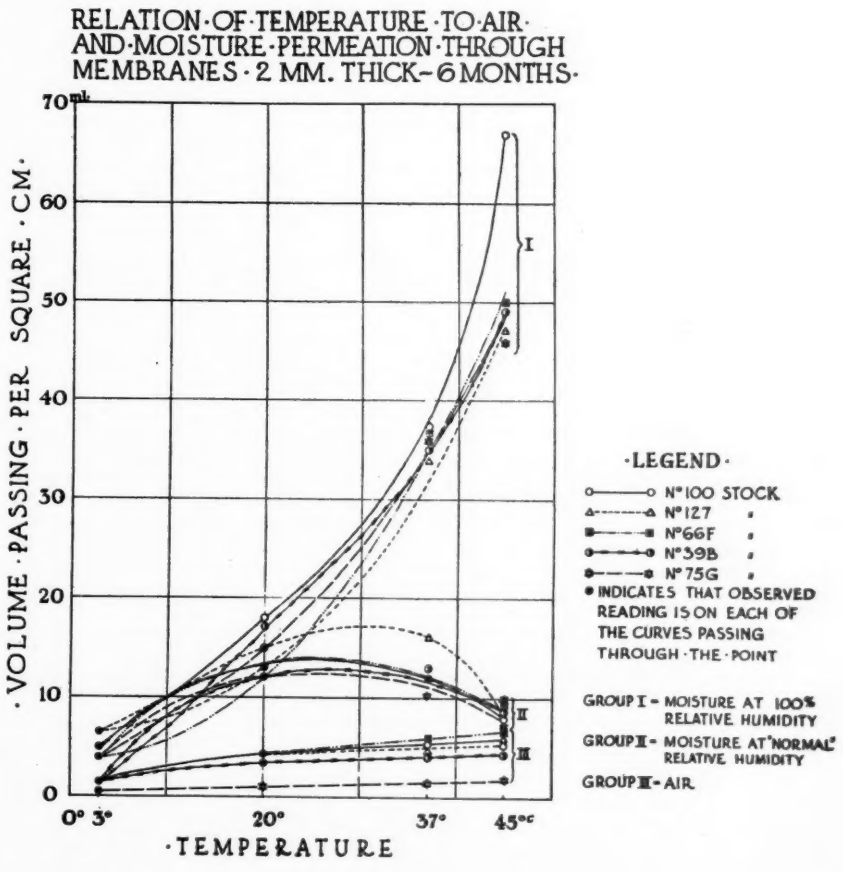


Fig. 2

Concerning the air and water vapor pressure differentials in Figure 2, see data for No. 72 stopper in Tables 4 and 7 and footnote [7] and to Table 7. The fact that at the higher temperature, particularly in the case of air, the differential is less would make the curves steeper were they corrected to a constant differential. Inasmuch as the quantity of air and moisture which has undergone permeation has been so nearly the same in the case of all the stocks (nearly constant residual moisture content of the horse serum and percentage vacuum remaining after any given time interval), the differentials may be taken as changing at about the same rate for all the stocks. Therefore the data as obtained furnish directly a satisfactory basis for comparison. At 0° the air pressure differential is approximately constant at 99 to 1, or 752 to 8 mm.

TABLE 4. VACUUM REMAINING IN RUBBER-STOPPERED LYOPHILE SERUM CONTAINERS AFTER SIX MONTHS OF STORAGE*

Stopper No.	No. 66F Stock Vacuum Remaining 2 to 4°C. %	20°C. %	37°C. %	45°C. %
57	98	97	94	93
72	85	62	43	25

*The air pressure differential on the two sides of the membrane at any given time is obtainable directly from the table by subtracting the corresponding percentage from 100; the ratio of the remainder to 100 is the differential.

TABLE 5. THE MOISTURE CONTENT OF LYOPHILE NORMAL HORSE SERUM AFTER SIX MONTHS OF STORAGE*

Stopper† No.	2 to 4°C. NRH‡ %	20°C NRH %	20°C 100% RH¶ %	37°C. NRH %	37°C. 100% RH %	45°C. NRH %	45°C. 100% RH %
57	0.9	1.4	1.4	1.3	3.7	1.8	4.4
72	1.5	4.0	5.0	4.1	11.1	3.9	14.1

*Concerning the water vapor differential on the two sides of the membrane, see footnote[†].
†No. 66F stock.
‡NRH="normal" relative humidity.
¶RH=relative humidity.

to permeation than any of the rubber stocks. Of the two Neoprene stocks, No. 75G was superior. No. 100 stock, having only pure gum, sulphur, and accelerator, became considerably less resistant to moisture at higher temperatures.

A very interesting observation was that serum in containers stored under water at 37°C. did not increase in moisture content any faster than those stored in air at 37°C., and 100% relative humidity. In other words a relative humidity of 100% caused as rapid a permeation of moisture as storage under water.

It was observed that the Neoprene stocks lost their elasticity upon storage. The holes under the thin membranes collapsed after a few months of compression within the necks of the container. One container stored under water for six months drew 6 ml. of water in around the edges of the Neoprene stopper (No. 75G). This was the only case of such an occurrence.

As an indication of the relative effectiveness of the two styles of stopper, the actual percentage of vacuum remaining in the containers after six months of storage is given in Table 4, and the moisture content of the serum in Table 5. Data have been included only for No. 66F stock, the one we believe to be generally best. The latter decision is based finally on general workability, lack of cracking, freedom from small holes, etc., inasmuch as several stocks gave similar results in the tests on air and

TABLE 6. EFFECT OF TIME ON MOISTURE DIFFUSION INTO RUBBER-STOPPERED LYOPHILE SERUM CONTAINERS*

Stopper No.	Temperature °C.	Humidity	No. 66F Stock Residual Moisture Original %	2 Weeks %	1 Month %	2 Months %	6 Months %	12 Months %
57	2 to 4	N.R.H.	0.50	...	...	0.80	0.90	1.30
	37	N.R.H.	0.50	...	...	1.20	1.30	2.10
	37	100 RH	0.50	1.0	1.6	2.00	3.40	6.00
	37	Under water	0.50	0.9	1.8	1.95	3.15	6.10
72	2 to 4	N.R.H.	0.50	...	...	....	1.50	2.30
	37	N.R.H.	0.50	...	...	1.90	4.0	4.70
	37	100 RH	0.50	2.5	4.1	6.50	11.10	17.00
	37	Under water	0.50	3.0	4.9	6.50	12.50	17.40

*Concerning the water vapor differential on the two sides of the membrane, see footnote [†].

TABLE 7. EFFECT OF TIME ON AIR DIFFUSION INTO RUBBER-STOPPERED LYOPHILE SERUM CONTAINERS*

Stopper No.	Temperature °C.	No. 66F Stock Vacuum Remaining 2 Weeks %	1 Month %	2 Months %	4 Months %	6 Months %	12 Months %
57	2 to 4	99	99	99	99	98	96
	37	99	99	98	95	94	92
72	2 to 4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	65
	37	93	85	77	56	43	17

*The air pressure differential on the two sides of the membrane at any given time is obtainable directly from the table by subtracting the corresponding percentage from 100; the ratio of the remainder to 100 is the differential.

moisture permeability. The permeation over a period of 12 months is shown in Tables 6 and 7.

It is evident that under controlled conditions of storage in the refrigerator, the No. 57 stopper appears to be satisfactory for protection of biologics for a long time. Whether or not the stopper is satisfactory for conditions of shipment involves the effect of the length of storage under adverse conditions. For periods of storage up to two months under very adverse conditions, the permeation of air and moisture through the No. 57 stopper does not seem to be serious. Tests on duration of potency have indicated that a residual moisture content of 2% may be tolerated. For greatly extended periods of storage, especially under adverse conditions, an all glass container is to be preferred, although its use by the physician is not so simple. The No. 72 stopper is satisfactory as a temporary seal if the storage is under refrigeration and not in excess of six months. The stopper is unsatisfactory for conditions met ordinarily in shipment. A well compounded rubber stock appears to be fully as satisfactory for sealing dry biologics as is one of Neoprene.

Sponge Rubber Hands for the Maimed?

TWO years ago Rev. Thomas McGlynn, O.P., a sculptor, now of Providence College, Providence, R. I., became interested in the possibilities of helping a girl who had lost her right hand in an automobile accident. With the assistance of a rubber company in Michigan, where he then resided, a reproduction of his sculptured model of the hand in sponge rubber was completed. With a suppleness not unlike that of flesh, the hand was attached to the arm by means of a rubber sleeve, molded with the hand and extending less than three inches above the amputation.

Father McGlynn believes that if reproduced from well-sculptured models in four or five sizes of each of a few types, a standard supply could be made available at a much lower cost than present artificial hands and that they would be much lighter, less cumbersome, and more life-like.

Desiring to contribute some small degree of comfort and pleasure to those afflicted, Father McGlynn has written to INDIA RUBBER WORLD that he will gladly assist any one who may be interested in the furtherance of this development. Any company desiring to investigate further the possibilities may communicate direct with Rev. Thomas McGlynn, O.P., Providence College, Providence, R. I., or letters addressed to INDIA RUBBER WORLD will be forwarded.

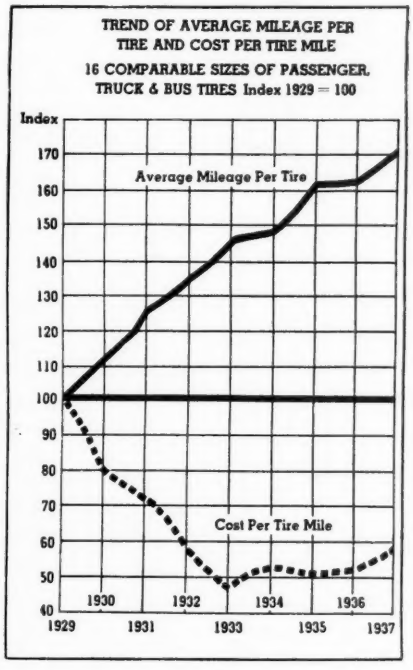
Benefits of Tire Improvement—1929 to 1937

P. W. Litchfield [1]

THE advancement made in the rubber industry emphasizes the democracy of capitalistic economy. The true test of economic progress in any industry is the extent to which consumers get progressively greater value for their money. Greater value can be passed on to consumers in any one of three ways:

1. By selling substantially the same product at lower prices.
2. By selling an improved product at the same price.
3. By selling an improved product at a lower price.

On the basis of tire mileage, which is what the customer really buys, tire prices have been steadily reduced, while tire quality has consistently increased. Thus the tire industry has been giving the public progressively greater value for every tire dollar.



Reduced Cost per Tire Mile

As a specific example of the fruits of economic progress, consider the automobile tire.

In 1929 the average best-quality tire ran 18,546 miles and cost the consumer a maximum[2] of $14.67. The single tire cost per mile traveled was therefore slightly under 8 one-hundredths of a penny.[3]

In 1937 the identical average tire ran 31,446 miles and cost the consumer a maximum[2] of $15.30. The single tire cost per mile traveled was therefore slightly under 5 one-hundredths of a penny.

Per mile traveled, the tire buyer paid 38½% less for his tires at the end of 1937 than he did in 1929.

The extent to which tire mileage has increased and tire costs per mile have fallen since 1929 is indicated in the accompanying chart.

On the basis of 1929 costs per mile, the purchaser of the identical tire in 1937 got $24.87 worth of mileage. But he only paid $15.30 for this tire and thus he got $9.57 worth of mileage free.

Besides, the 1937 tire provided easier steering and better cushioning and proved to be considerably more resistant to puncture and blowout dangers. The value of these factors cannot be accurately measured, but, whatever it may be, it is in addition to the worth of the extra miles delivered.

[1] President, Goodyear Tire & Rubber Co., Akron, O.
[2] This assumes that the consumer received no discount or trade-in allowance.
[3] These figures are based on a composite tire representing a fair overall average of passenger and truck tires sold.

The direct beneficiaries of this accomplishment were the owners of the 29,000,000 automotive vehicles in use last year. Each of these car owners, in effect, got enough free mileage to drive approximately four times from New York to California.

Increased Earnings to Labor

Not only tire users, but tire workers have benefited from the economic progress made since 1929. In 1937 the average hourly rated and piece work employe in an Akron tire factory (including skilled and unskilled male and female employes) received 36% more per hour worked than in 1929. Total annual earnings of these tire workers amounted to approximately $1,500 apiece last year.

Increased Tax Contribution

On the assumption that each individual citizen participates in the benefits of all taxes collected by the government, the entire population also became a collateral beneficiary of developments in the tire industry from 1927 to 1937. In actual practice business serves as a tax collector for the government because the business has to make its tax payments out of what it gets for the sale of its product to the public.

As taxes for the support of public institutions and activities, the manufacturer contributed: in 1929, 14¢ out of the selling price of $14.67; in 1937, 84¢ (a sum 500% greater than in 1929) out of the selling price of $15.30.

The company had to pay for its materials, labor, selling, and distribution costs, and find its profit out of what was left *after* the payment of taxes.

Democracy of Capitalistic Economy

These facts and figures do more than indicate the benefits that accrued to the average purchaser of tires in 1937 as contrasted with 1929. They show, in fact, how the modern business operates for the general good. They afford an example of the democracy of our capitalistic economy.

To give the consumer greater tire value for his dollar there had to be a healthy desire upon the part of the producer to make a better article. Moreover there had to be the means—the resources of finance, machinery, and man power; and the willingness to take the risks involved in

(*Continued on page 39*)

Instrument for Measuring Whiteness[1]

New Jersey Zinc Co.'s Method for Determining the Reflectivity of White Rubber Compounds

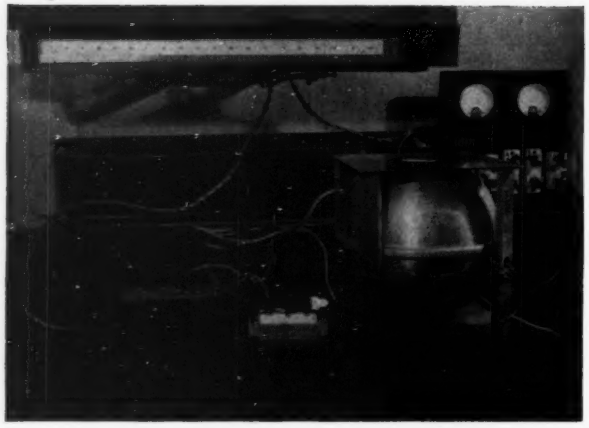


Fig. 1. Complete Operating Assembly

IN THE development of pigments for white rubber goods and for production control work, it is desirable to have a simple method to evaluate numerically the brightness of the white rubber compounds. A precision instrument[2] has been designed in the Palmerton Laboratories which measures the light reflected from a smooth rubber surface, and these measurements have been found to correlate very well with visual gradings, provided that there is not too much difference in the color tone of the specimens under consideration. The difference in visual grading of one shade represents approximately 0.5% difference in reflectivity.

The general arrangement and the construction of the instrument are shown in Figure 1 and in the detailed drawing, Figure 2. A rubber sample, which is placed over the opening in the top plate, is diffusely illuminated by the inside walls of the sphere, which are in turn illuminated by electric bulbs. These bulbs are shielded so that they do not shine directly on the sample. Light reflected from the sample passes through an aperture, through a tube, and thence to a light-sensitive cell. This cell has the property of generating current which is directly proportional in strength to the intensity of the light falling upon it. Therefore the galvanometer, which is arranged to measure current, deflects in proportion to the amount of light reflected from the rubber sample.

In Figure 2, 1 is one of four upright members which form the vertical part of the framework; 2 is the illuminating sphere, and 3 and 4 are bent strips of brass which add rigidity to the structure; 5 is a brass plate which forms a part of the framework and furnishes a flat surface to receive the sample. It carries a 2-inch orifice in the center over which the sample is placed. Next, 6 is a similar plate beneath the sphere, which is attached by the angles 7; 8 is a collimating tube carrying an aperture 9 at the top; while 10 is a holder for glass filters, and 11 is the holder for the correction filter and the light-sensitive cell. The illuminating sphere is an aluminum

[1] This instrument was referred to on page 34, July issue, India Rubber World, in the article "Zinc Sulphide for White Compounds."

[2] This instrument was originally designed in connection with a study of the optical characteristics of paper and is a modification and refinement of an earlier instrument used by Gamble in the study of the brightness of paint films. The instrument was described in detail by F. A. Steele in the *Paper Trade J.*, Oct. 24, 1935.

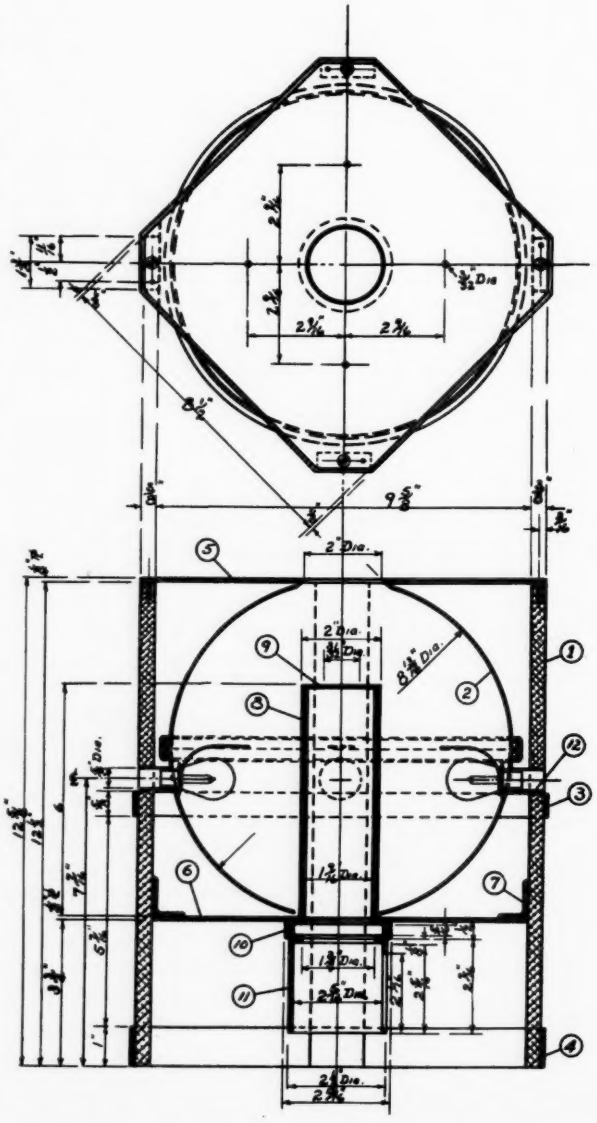


Fig. 2. Detailed Drawing of Illuminating Sphere and Specimen Plate

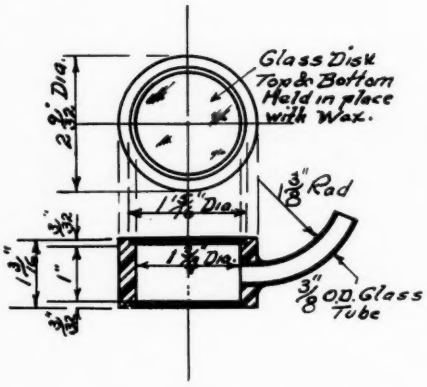


Fig. 3. Cell for the Light Filter

ball made in two halves and held together with a removable clamp. The inside of the sphere and the outside of the collimator are painted white for maximum reflected light, and the inside of the collimating tube is painted black for maximum light absorption.

Of the factors contributing to the limit of reproducibility of observations on this instrument, perhaps the most difficult to regulate is the current supply. With a bulb operating just under seven volts, a variation of 0.0005-volt will change the brightness of the filament, and hence the apparent reflectance of the sample, about 0.2%. For this reason larger changes in the voltage between the observations of the standard and the sample must be eliminated, and even closer regulation is highly desirable. Storage batteries were used for this purpose since they are quite free from rapid irregular variations in voltage although they do show a gradual decrease during discharge.

There are a number of light-sensitive cells available of the barrier-layer type, any of which might be satisfactory. In the reflectometer under discussion, Model 594 Photronic Cell manufactured by the Weston Electrical Instrument Corp., has given very satisfactory results. A galvanometer suitable for the cell current was selected; in fact it was found desirable to have the maximum output of the cell much larger than the range of the galvanometer.

The cell is more sensitive to the red end of the spectrum than the human eye, and for this reason a correction filter is used, which causes the cell to respond to the various colors to the same relative degree as the human eye. The filter cell is a hard rubber tube, shown in detail in Figure 3, which fits into the lower part of the instrument above the photronic cell. It is fitted with glass ends, which are one inch apart on the inside. A glass tube, sealed into the side, is used for filling. The solution used in the cell is made up as follows:

Solution No. 1, $CuSO_4 \cdot 5H_2O$ solution, saturated at room temperature

Solution No. 2, 5 grams $K_2Cr_2O_7$ in 500 cc. water

These are stock solutions, diluted for use as follows:

Solution A, 15 cc. Solution No. 1 + 85 cc. water

Solution B, 10 cc. Solution No. 2 + 90 cc. water

The filter cell is filled with a 50:50 mixture of Solutions A and B.

In measuring the reflectance of a sample, the instrument is first adjusted to give some standard galvanometer deflection with a standard of known reflectance. Magnesium carbonate in block form with a reflectance of 98% serves as a satisfactory standard. The standard specimen is then replaced by the rubber and the new deflection observed. If the response to the instrument is linear, $R_2 = \frac{D_2 R_1}{D_1}$, where R_2 is the reflectance of the sample, R_1 the reflectance of the standard, and D_2 and D_1 the deflections obtained with the sample and standard, respectively.

The precision with which readings can be reproduced is quite high; no difficulty ordinarily is encountered in reproducing the readings on a series of samples to 0.2% if the instrument is operated with reasonable care.

37,000,000-Car Registration Prophesied for 1960

DESPITE present unfavorable conditions, the automotive industry, it is reported, expects by 1960 a registration of 37,000,000 passenger cars in the United States. On the basis of present population this figure means at least every third person would own an automobile, compared with present registration of about 25,410,000 cars, or one for every fifth person.

Greatest expansion in automobile registration occurred during 1920-1929, when the total rose from 8,225,859 to 23,121,589. Yet today, when we are in the throes of a recession after the worst depression on record, motor vehicle registration is more than 2,000,000 higher than in 1929, when we enjoyed our greatest prosperity. Many reasons for this paradox exist. Prices of automobiles are cheaper, and the life of a car has been lengthened. Besides more convenient financing plans have been arranged for purchasers.

Reduction in prices was effected by a greater increase in efficiency in the automobile industry. No small part of this was contributed by technological improvements in the manufacture of rubber, and, of course, the reduced price of rubber.

For 1937 sales of tires and sundries used for automobiles totaled $398,235,000, and 329,390 long tons of crude rubber were used in their making. For last year mechanical goods accounted for 46,772 long tons of crude, and sales of these products were valued at $138,014,000. Some cars now boast as many as 175 individual rubber parts, and the trend is toward even greater use of rubber goods in making automobiles.

The greater efficiency of automobiles is due to ingenuity of design, improvement in fuels, and development and use of better materials.

Employment will have to rise if the industry hopes to achieve its 1960 goal. In 1929, when all plants were operating at or near capacity, output of passenger cars totaled 4,587,400. In 1937 the figure was 4,751,520. The full-time capacity on an annual basis is estimated at somewhat under 5,000,000 cars. As the maximum life of most autos is about eight years and the average life six, the entire present plant capacity would have to run full time to replace a registration of 30,000,000 cars every seven or eight years, not to mention 37,000,000.

Benefits

(*Continued from page 37*)

the opportunities offered by a free, competitive, economic system.

The fruits of this joint effort were broadly shared. In the final reckoning the consumer received the greatest portion of the benefits—$9.57 worth of additional tire mileage; the public through the government got an additional share—70¢ in the form of increased tax receipts; and tire workers enjoyed a 36% higher hourly wage rate.

Progress in Rubber Testing

June Meeting of A. S. T. M. Reviews Annual Accomplishments and Present Status

THE forty-first annual meeting of the American Society for Testing Materials was held at Chalfonte-Haddon Hall, Atlantic City, N. J., from June 27 to July 1, with an attendance of 1,138. Owing to the proximity to New York City and the World's Fair, it was decided to hold the 1939 annual meeting at Atlantic City and in conjunction with it, the Fifth Exhibit of Testing Apparatus and Related Equipment. The 1939 Committee Week will be held in Columbus, O., during the week of March 6 to 10; a regional meeting featuring technical sessions on lime and heat insulating materials will also be held during this week.

Committee D-11 on Rubber Products

NEW MEMBERS. O. M. Hayden, of E. I. du Pont de Nemours & Co., Inc., Committee D-11 chairman, reported that new members added during the past year included: E. R. Dillehay, The Richardson Co.; L. Enderlin, Institut Français du Caoutchouc; H. J. Flikkie, The B. F. Goodrich Co.; I. A. Hunt, Federal Products Corp.; D. E. Jones, American Hard Rubber Co.; W. H. Juve, consulting rubber technologist; F. S. Malm, Bell Telephone Laboratories; C. P. Morgan, Vulcanized Rubber Co.; C. C. Rose, Willard Storage Battery Co.; and C. C. Wallace, Electric Storage Co.

STANDARDS AND SPECIFICATIONS. The committee submitted a number of important recommendations to its members for approval.

A new standard, "Tentative Methods for Testing Flat Rubber Belting," which is in effect a revision of "Standard Methods of Testing Rubber Belting Used for Power Transmission," covers test procedures for evaluating the physical properties of the flat type of rubber belting which contains cotton duck reenforcement, including belting for transmission of power and for conveying and elevating material.

The following tentative standards were revised at the meeting: Methods of Physical Testing of Rubber Products; Methods of Testing Rubber Hose; Methods of Testing Rubber Insulated Wire and Cable; Specifications for Rubber Insulated Wire and Cable. Standards revised were: Methods of Chemical Analysis of Rubber Products; Specifications for Cotton Rubber-Lined Fire Hose for Public and Private Fire Department Use. The following tentative standards were adopted as standard: Specifications and Tests for Friction Tape for General Use for Electrical Purposes; and Specifications and Tests for Rubber Insulating Tape.

SUBCOMMITTEE V ON INSULATED WIRE AND CABLE is working on proposed specifications for rubber sheath compound for portable cords and cables. Difficulty is being experienced in finding tests which adequately measure the resistance of the insulation to abrasion and tearing.

SUBCOMMITTEE VI ON PACKINGS, GASKETS, AND PUMP VALVES is working on a definite program of standardization on valves and packings with attention given to performance tests as well as to the ordinary simple acceptance tests.

SUBCOMMITTEE X ON PHYSICAL TESTING OF RUBBER PRODUCTS has conducted a cooperative tension testing program in five laboratories which showed in general that where a single laboratory uniformly mixed and cured a rubber compound and prepared dumbbell specimens which were subsequently tested in the five laboratories, reasonably uniform tension test results could be obtained. However this uniformity did not hold when the different laboratories died out their own specimens. Owing to these results more work on sample preparation was felt to be necessary, and the committee is organizing a section to carry out this investigation.

SUBCOMMITTEE XI ON CHEMICAL ANALYSIS OF RUBBER PRODUCTS has been investigating colorimetric methods for the determination of small amounts of manganese and copper in rubber.

SUBCOMMITTEE XV ON LIFE TESTS FOR RUBBER PRODUCTS has organized a section to conduct a survey of laboratories relative to methods of light aging and to formulate standard procedures for sunlight aging and sunlamp aging.

SUBCOMMITTEE XVII ON RUBBER PRODUCTS FOR ABSORBING VIBRATION, in recognition of the need of the development of a small portable hardness testing instrument having greater reliability than existing instruments, is preparing an outline specifying in detail the desired characteristics of such an instrument.

SUBCOMMITTEE XX ON ADHESION TESTS has made a comparative study of adhesion tests of rubber to metal, in which the separating force is applied to the adhered surface in direct tension, and then in shear. This work included tests on stocks of five different hardnesses and of three different thicknesses.

SUBCOMMITTEE XXIII ON HARD RUBBER, which held its organization meeting in March, 1938, has prepared a list of important properties of hard rubber to be investigated in the work of standardizing test methods: physical group—tensile strength and elongation, transverse and deflection tests, impact strength, hardness, cold flow, softening point, effect of high and low temperature, compressive strength, coefficient of linear expansion, thermal conductivity and flammability, aging properties, surface defects and appearance, and machining properties; chemical group—acid absorption, solubility in acids, resistance to chemical reagents and solvents, chemical analysis, and tarnishing effect; electrical group—dielectric strength, surface resistivity, power loss factor, arc resistance and carbonization, and the aging effects on the electrical properties.

Physics of Rubber as Related to the Automobile–I[1]

W. F. Busse[2]

THE automobile is largely responsible for the development of the rubber industry. Rubber, in turn, has made such important contributions to the safety, comfort, efficiency, and quietness of the modern automobile that an automobile without rubber is almost inconceivable. Rubber tires not only cushion road shocks and withstand abrasion, but they also make steering possible. In many other less obvious places rubber products play an equally essential role. I need only mention fan belts, which may transmit loads up to 10 or 15 h.p. at linear speeds over a mile a minute, motor mountings which isolate the vibration of the motor from the rest of the car, insulation strips between metal parts of the body to prevent squeaking, hydraulic brake hose, running-board covers, windshield wipers, and sponge rubber or rubberized hair (Nukraft) cushions in upholstery, to illustrate the host of other minor, but essential uses. It is reported that rubber is used in some 180 places in the modern car.

The many different uses for rubber depend in nearly every case on its unusual *physical* properties and on the combinations of physical properties that can be obtained by modifying the rubber and by combining it with fabrics and metals in various mechanical structures. This has been recognized to the extent that physical tests are used almost universally to judge the quality of rubber goods. However it is only recently that any intensive effort has been made by physicists to relate the gross physical properties of rubber to the physical and mechanical properties of the rubber molecules. This work already has yielded a surprising amount of very practical, as well as fundamental scientific information. In this paper I will try to show by a few examples how this new information, as well as the older fundamental laws of classical physics, are being applied to improve the old and develop the new rubber products.

Functions of the Physicist

The problems of the physicist in the rubber industry may range from those bordering on pure chemistry to those bordering on pure mechanical engineering or mathematics; and in certain problems concerned with viscosity and with infra-red spectra, there is even the possibility that there may be a use for the quantum theory. In general, the problems fall in three groups:

1. Processing problems. These include: studies of the flow properties of rubber pigment systems having both elasticity and plasticity; heat conduction problems; statistical studies of variability of raw materials, processes, and products.

2. Fundamental studies of the physical and mechanical structures of the rubber molecules.

3. Development of new and more efficient rubber products. This often involves finding better methods of combining the high elasticity of rubber with the rigidity and strength of other structural materials such as fabrics and metals.

In this connection it is curious that the one property, high elasticity, which probably is more responsible than any other for the present wide range of uses of rubber, both makes possible and hinders certain new uses.

The average person used to dealing with inherently rigid materials such as metals, wood, and stone, instinctively associates strength with rigidity. We are inclined to feel that a material which can be stretched 600 to 800% before failure must be inherently weak and cannot be trusted to carry loads even if the stress required to produce the failure may be nearly 5,000 lb./in.^{2}, calculated on the original cross section, or as much as 30,000 to 40,000 lb./in.^{2}, calculated on the cross-section at break.

The skepticism concerning the reliability of rubber may have been partly justified in the past, not because of its high elasticity, but because of other properties such as low tear resistance, rapid deterioration, or excessive creep. Today, however, compounds have been improved, and their limitations as well as their advantages are known more accurately. In addition the mechanical design of rubber mountings has been improved so that now rubber in shear can be used to support the entire static and dynamic load of large industrial machines weighing up to eighty tons, or to replace steel springs on street cars. It is now even possible to use rubber torsion springs to replace the springs of automobiles.

Plasticity Determination

It was thought for a long time that breakdown involved a mechanical disintegration of rubber, but it is now known to be due to an oxidation process.

Proper control of the rubber manufacturing processes requires a quantitative measure of this complex property, plasticity, which involves both elastic deformation and viscous flow, both of these factors, in general, being functions of time and of rate of flow. Physicists have made important contributions to the methods of measuring these factors, but the measurements still are necessarily empirical, and much remains to be done on the general problem of the flow of visco-elastic systems.[3]

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[1] Abstracted from the *J. Applied Physics*, July, 1938, pp. 438-51. Paper presented at the Symposium on Physics in the Automotive Industry at Ann Arbor, Mich., Mar. 14 and 15, 1938.

[2] Physical research laboratory, B. F. Goodrich Co., Akron, O.

[3] It may be noted that for a long time theoretical physicists have ignored almost completely the problem of the cause of, or the mechanism producing the viscosity of simple homogeneous liquids. No theory of the viscosity of liquids gave even the proper sign for the temperature coefficient of viscosity, and, except for the almost isolated attempt by Maxwell to explain the elastic after-effects of solids, the effects of elasticity on flow were completely ignored. In the past few years Dunn (1925), Andrade (1934), and others have developed theories that give both the correct sign and magnitude of the changes in the viscosity of simple liquids with temperature, and these ideas have been used in studying the state of rubber in solution. Eyring [*J. Chem. Phys.*, 4, 283 (1936)] has attempted to work out a more general theory of viscosity on a quantum-mechanical basis, which may also explain some of the elastic properties. Rubber solutions should be ideal systems for testing this theory, since they can be varied in concentration from 0 to 100%, with over 10^8-fold changes in viscosity and probably equally great changes in elasticity. [See Ewell, *J. Applied Physics*, 9, 251 (1938)].

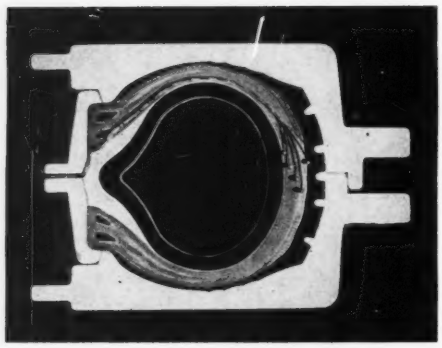


Fig. 1. Cross-Section of Tire and Water Bag in Mold Showing Location of Thermocouples

Rate of Heating

The soft, plastic mixtures of rubber and compounding ingredients are of only limited use until they are vulcanized under controlled conditions. The physical properties of the final compounds, as well as their resistance to aging, depend to a large extent on the temperature to which the rubber is heated and the time it is held at that temperature. Because rubber is comparatively a poor conductor of heat, the problem of getting a uniform heating of thick objects is not an easy one.

In some cases, as with long rods or flat plates, the rate of heating may be calculated from theory, provided the diffusivities of the compounds are known. Hence it is important to have accurate measurements of the specific heat and conductivity of rubber and pigments such as sulphur, zinc oxide, and carbon black.

Most rubber objects are so complicated in shape and construction that it is impossible to calculate their rates of heating from theory, and actual temperatures at different places in the sample must be measured at various times during the cure. This usually is done by building thermocouples into the object, such as a tire, and measuring temperatures with a potentiometer. Figure 1 is a cross-section of a tire and water bag in a mold, showing the distribution of the hot junctions through the tire. The first junction is at the surface of the tread, the second is immediately under the tread, and the sixth is at the inner surface of the tire next to the water bag, with the others at the fourth, eighth, and twelfth plies.

Fig. 2. Tire Mold in Heater Showing Thermocouples Coming Out to Switch and Potentiometer

The mold containing the tire and water bag is put in a heater which can be filled with steam under pressure, the thermocouple leads being brought out of the heater through a special packing gland. Figure 2 shows the mold in the heater and the thermocouple connection to the potentiometer. Figure 3 shows typical curing curves obtained. Hot water under pressure is first put in the inner water bag for 20 minutes. This heating under pressure makes the tire conform to the grooved inner surface of the mold and allows the heat to pass through the water bag to the inside of the tire. Steam is then applied outside the mold, causing a rapid temperature rise at the surface of the tire. The temperature rises more or less uniformly in the other plies, and at the end of 120 minutes the external steam temperature is reduced, partially cooling the mold. The tire is removed at 180 minutes. It will be noted that all parts of the tire receive nearly equivalent cures.

If, instead of using this "hot-water cure" one tried to heat the tire entirely from the outside and used only compressed air in the inner bag to force the tire into the grooves of the mold, heating curves similar to those shown in Figure 4 might be obtained. Here the inner plies of the tire do not come within 60° of curing temperature in three hours. Under these conditions the various plies would have to contain compounds of different rates of cure, those on the inside curing at the lowest temperature, and the outer plies curing at progressively higher temperatures. This would, of course, involve considerable difficulty from a production standpoint, making the "air bag" cure less satisfactory than the hot water cure.

Molecular Structure

Not very much is known about the chemical reactions that occur during vulcanization except that they usually involve some combination of rubber with sulphur. The effects on the physical properties are very striking, however, and they give some clews to the change which takes place in the molecular structure.

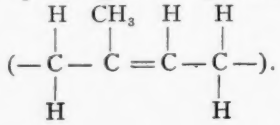
The uncured rubber compound has almost no strength, yet after cure it may have an ultimate tensile strength of 4,000 to 5,000 lb./sq. in. and an elongation of 600 to 800% or more, as shown in Figure 5. Since the rubber decreases in area almost in direct proportion to the elongation, the strength of the rubber may be around 40,000 lb./sq. in. if calculated on the cross-section at break.

Another very striking change produced by vulcanization is in the behavior toward solvents. Uncured rubber dissolves in benzol to form a viscous solution; while well-cured rubber may swell to 1,000% of its initial volume, without losing its shape.

Staudinger and others have shown that the viscosity of a material in dilute solutions may give at least some indication of the molecular weight. As a result of viscosity and osmotic pressure tests, it has been shown that crude, unvulcanized rubber is composed of long, thread-like molecules having molecular weights of the order of 10,000 to 100,000 or more.

When molecules become this large, chemical methods of studying them are very unsatisfactory. For instance, to detect a chemical reaction involving the combination of one molecule of rubber of molecular weight 100,000 with one atom of oxygen or with one atom of sulphur would require tests sensitive to 0.016% combined oxygen or 0.032% combined sulphur. Even these tests would not tell much about where or how the oxygen or sulphur had combined.

As the molecular weight increases, certain physical properties which depend on the $\frac{1}{2}kT$ erg of translational kinetic energy per mole, such as vapor pressure or osmotic pressure, also become relatively unimportant. However, since the mechanical properties of these large molecules such as elasticity, or swelling in solvents, become very sensitive to changes in structure, mechanical tests are more important in studying the molecular structure than chemical measurements. The chemical data available today suggest that the uncured rubber molecules are made up of a great many rearranged isoprene units



Physical tests suggest that they form long chain or thread-like molecules. Vulcanization then probably involves forming cross bonds between the different chains.

Certain fundamental conclusions about the structure of rubber can be drawn from purely geometric considerations. Rubber can be stretched nearly 1,000%, without an appreciable change in density, and it will regain substantially its original shape when released. In this process, on the average, the x components of the distances between atoms in the rubber are increased tenfold, while the y and z components are each reduced by the factor $(10)^{\frac{1}{2}}$. It is known from band spectra and crystallographic data that atoms themselves do not have this deformability, and that any tenfold, or even two- or threefold increase in the distance between atoms held together by either polar or homopolar bonds would inevitably result in rupture.

It follows that rubber must contain some mechanical structure which magnifies the slight extensibility and deformability of single atoms. Such a structure could be formed by holding atoms together by strong forces in long chain molecules which were surrounded by weak or uniform secondary valence forces. This would allow the molecules of rubber to slip past each other easily when they were deformed.

It may be noted that the requirement of long chain molecules is met by many materials such as cellulose, certain resins and polystyrol; but these materials are not elastic under ordinary conditions because the secondary valence forces around these molecules are too high. When these secondary valence forces are isolated or insulated by adding small molecules (plasticizers) which are adsorbed on the fiber molecules, the materials become elastic. Polyvinyl chloride, for example, is a hard, horny material, but if 60 parts of polyvinyl chloride are heated and pressed with 40 parts of tricresylphosphate, a very elastic, but tough material (Koroseal) is formed.

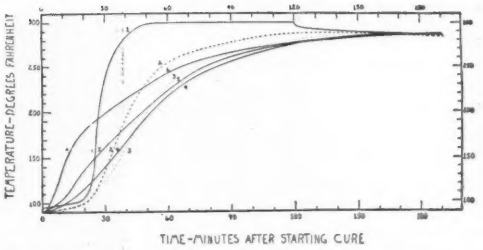


Fig. 3. Temperatures within a Tire during "Hot Water" Cure. Couple No. 1, at Surface of Tread; Couple No. 2, at Base of Tread; Couple No. 3, at Top of Twelfth Ply; Couple No. 4, at Top of Eighth Ply; Couple No. 5, at Top of Fourth Ply; Couple No. 6, at Surface of Inner Ply

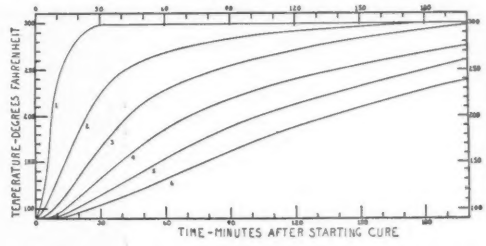


Fig. 4. Temperatures within a Tire during "Air Bag" Cure; the Location of the Couples Is the Same in Fig. 3

Elasticity

The remarkable thing about the elasticity of rubber is not the great extension, but rather the nearly complete recovery when the external stress is removed. This requires that the long, thread-like molecules be tied together in a few places along their length to form some sort of a three-dimensional network. The stretching force then lines up the atoms in a more or less parallel array, decreasing the disorder, or entropy, of the system. On removal of the external stress, the kinetic vibration of the atoms within the chains tends to restore the state of disorder or maximum entropy, in which the chains have irregular, zigzag shapes. Because the chains are interlocked into a network, the contraction of the chains into a zigzag shape brings the whole sample back to substantially its original shape.

Because this type of deduction gives only a broad, general picture, the detailed information about the structure of the mechanical rubber molecules must be obtained by means of other physical tools. One that is of particular interest is infra-red spectroscopy. Figure 6 shows the infra-red transmission spectra of crude rubber and of ebonite $(C_5H_8S)_n$, obtained by Dr. Sears, of our laboratory, while at Ohio State University. The larger peaks can be identified as due to vibrations of atoms or small groups within the molecules, such as $\nu(C-H)$ at 3.4 mu and $\delta(CH_2, CH_3)$ at 6.86 mu. One might attribute the 11.8 mu band in crude rubber to C — C vibrations and the 6.0 mu band to C = C vibrations; but the latter band also appears in ebonite which is not supposed to have any double bonds, and the 11.8 mu band is almost suppressed in ebonite, although it should have just as many C — C bonds as does crude rubber. The spectrum of soft vulcanized rubber out to 15 mu does not differ appreciably from that of crude rubber. The infra-red data agree quite well with the data from the Raman spectra of rubber.

X-rays have thrown considerable light on the structure of rubber. Figure 7a shows the amorphous pattern of an unstretched sample of cured rubber containing only a small amount of pigment. When this sample is stretched 600%, the beautiful fiber crystalline pattern shown in Figure 7b is obtained. Similar effects can be obtained with crude rubber, but the crystallization is not quite so perfect. The pattern of a heavily loaded tread compound is shown in Figure 8.

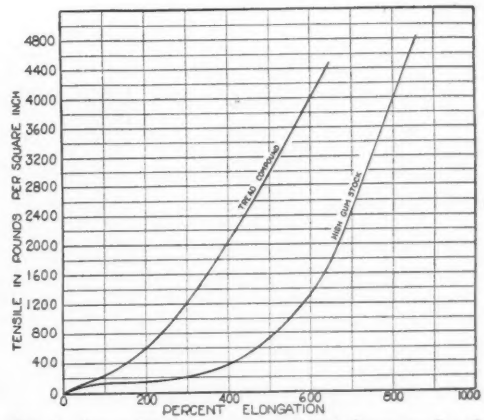


Fig. 5. Stress-Strain Curves of Tread Compound and of High Gum Compound

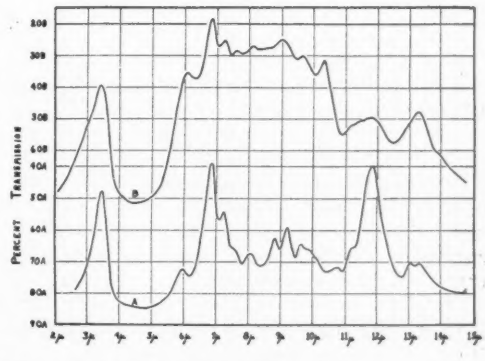


Fig. 6. Infra-Red Transmission Spectra of Crude Rubber (A) and Ebonite (B)

The inner broad diffuse band is due to amorphous rubber; while the outer narrow bands are due to pigments, especially zinc oxide. The orientation of the rubber crystallites produced by stretching this compound to 600% is less perfect than in the high gum compound. It will be noted that there is a tendency for the zinc oxide particles to orient in the direction of stretch. These pictures were taken by Professor Clark at the University of Illinois.

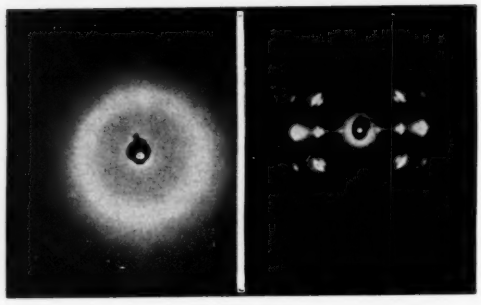
The crystallization of rubber on stretching accounts for a number of peculiarities in its gross physical properties. A sample of crude rubber which is stretched and released normally snaps back to its original dimensions. However, if the sample is cooled a few degrees below room temperature while it is held stretched, it retains most of its elongation when the deforming force is relieved—that is, it becomes "racked." On warming, it returns to its initial size. The racked rubber not only shows fiber crystallites with X-rays, but it also has a mechanically fibrous structure, as can be shown by tearing it.

During stretching, rubber gives off considerable heat, and on contracting, it cools. This behavior is the reverse of that found with metals. This so-called Joule effect in rubber, which is due to the latent heat of crystallization, may easily be demonstrated by stretching a rubber band and putting it to the cheek. It follows from thermodynamics that if rubber gets warmer on stretching, stretched rubber should contract when heated. Within a certain range of loads and elongations, this is found to be true, and stretched rubber has been used as a heat engine to transform heat into work.

Tear Resistance

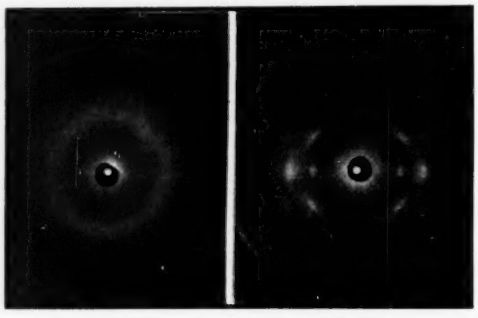
The mechanical properties of rubber molecules and fiber crystals often are shown rather clearly by their effects on other gross physical or mechanical properties of the rubber, such as tear resistance. Tear tests are, in fact, useful in studying these structures, but they are complicated by a number of geometric factors.

If rubber remained an isotropic, elastic material when stretched, and the stress-strain



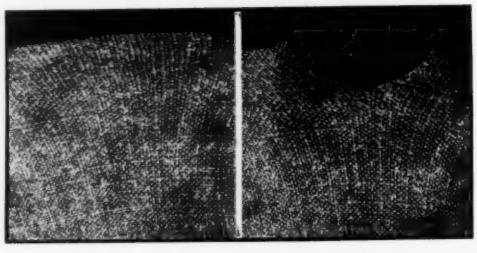
(A) (B)

Fig. 7. X-Ray Diffraction Patterns of a High Gum Compound: (A) Unstretched; (B) Stretched 600%



(A) (B)

Fig. 8. X-Ray Diffraction Patterns of a Tread Compound: (A) Unstretched: (B) Stretched



(A) (B)

Fig. 9. Strain Distribution in Rubber during Tear: (A) Is before a Tear Starts; (B) Is after a Cut or Tear Is Put into the Edge of the Sample

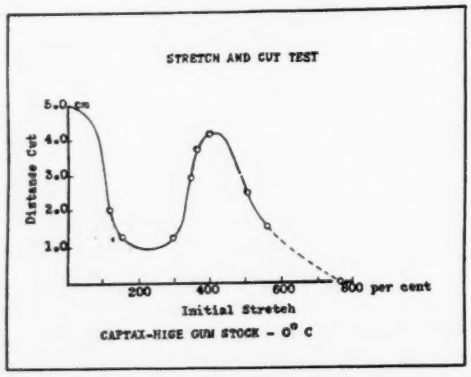
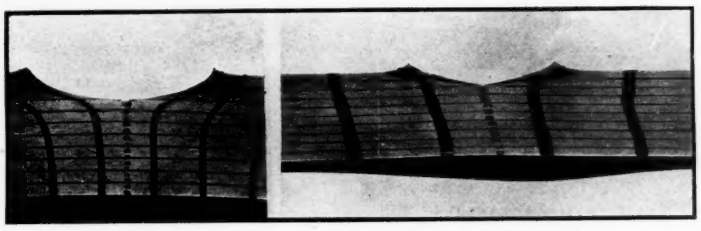


Fig. 10. Effect of Initial Stretch on Length of Cut Necessary to Start a Tear

curve of the rubber and the geometry of the sample were known, one could calculate the force needed to make a tear travel through a particular sample. If the sample has a straight edge, it takes a considerable force to start a tear, but once started, the force required to make it continue is surprisingly small. The reason for this is shown in Figure 9, which shows the strain distribution at the edge of a thin piece of rubber that is being torn. The unstretched rubber was marked with two mutually perpendicular series of straight lines about 1/50-inch apart. The first picture shows that when a piece of rubber having a straight edge is being torn, a considerable amount of rubber must be stretched to a high elongation before the edge is stretched to its breaking point. If a cut is first made in the rubber, the strain distribution is that shown in the second picture. It is seen that only a very small area of rubber ahead of the cut is being stretched. Therefore, only a relatively small force is required to tear it.

As a rule, the calculated tear resistance differs widely from the observed tear resistance, but the discrepancies furnish clues to the structural changes which occur. The following example shows some of the complications that are observed. Samples two inches wide and about six inches long were stretched a definite amount, and, while held at this elongation, a cut was made across the strip until a tear formed which traveled the remainder of the way of its own accord. This was repeated with different elongations, and the distance it was necessary to cut to start a tear was then plotted against initial elongation. Two points on this curve can be set down at once. At no stretch the sample must be cut all the way across, and when stretched to the ultimate elongation, no cut is necessary to make it tear across. At first sight one would expect a smoothly descending curve between these two points. Actually one may get a very different curve, as shown in Figure 10, which was obtained with a high gum compound such as might be used in an inner tube. The curve rises at about 300% elongation, the same point at which one begins to notice a crystal structure in X-ray tests.

The explanation of these results is shown in Figure 11.



(A) (B)

Fig. 11. Effect of the Order of Stretching and Cutting on the Distribution of Strains

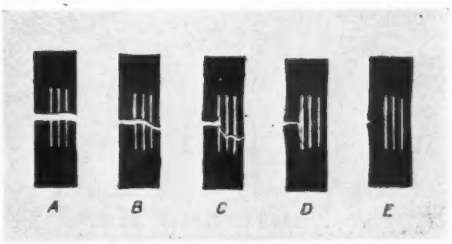


Fig. 12. Tearing of Tread Compound When Flexed at Various Elongations

TABLE 1

Sample	Stretching Cycle	Life (Min.)
A	0-60%	10
B	10-60	25
C	15-60	90
D	17-60	150
E	20-60	Infinite

Sample *A* was cut ¼-inch and then stretched so that the elongation ahead of the cut was about 500%. Sample *B* was first stretched to 500%; and then the cut was made. The lines on the samples formed squares in the unstretched state; so they indicate the strains in the stretched samples. The strain distribution in sample *A* is about that which would be expected in an isotropic elastic medium, but sample *B* has a definite rigidity. This rigidity causes the maximum at about 500% in the curve of Figure 10.

An even more curious behavior is found if rectangular strips of tread stock are cut and then flexed through various cycles until the tears travel across the samples. The samples shown in Figure 12 were all cut to the first line from the left edge and then stretched to different overall elongations. The results shown in Table 1 were obtained. The life of sample *E* is considered infinite as far as this test is concerned, because the tear actually turned backwards. This phenomenon is related both to the molecular structure of the tread compound and to its abrasion resistance on the road.

(To be concluded)

Pneumatic Tires

(Continued from page 32)

great deal more detail. It is interesting to note that in this application Dunlop pointed out the great value of pneumatics on soft ground, and in recent years this has been stressed by modern tire men interested in equipping farm equipment with air tires.

In the final patent[8] he claimed: "My improvements are devised with a view to afford increased facilities for the passage of wheeled vehicles—chiefly of the lighter class such for instance as velocipedes, invalid chairs, ambulances—over roadways and paths, especially when these latter are of rough or uneven character, as also to avoid the sinking of the wheels of vehicles into the ground travelling over boggy soil or land; and likewise for the tyreing of wheeled vehicles generally, in all cases where elasticity is requisite and immunity from vibration is desired to be secured, and at the same time ensuring increased speed in travelling owing to the resilient properties of wheel tyres according to my invention."

Meeting Edlin one day, Dunlop found the merchant wondering why he had not ordered wheels for his tricycle. Learning that the veterinary had made them himself, although he had never made any wheels before, Edlin expressed the opinion that they must be very poor wheels and laughed when Dunlop stated that the machine was faster than anything the expert could make. When it came to a trial, however Edlin, who had been a racing man, found himself unable to outpace young Johnny Dunlop and immediately became a pneumatic enthusiast himself. Dunlop's boy soon became a well known figure on the streets on the grotesque machine which got the name of "mudcart."

Almost as many ridiculous stores have been told about these first Dunlop tires as have been related about Goodyear's discovery of vulcanization. One tale which has gained wide circulation is that Dunlop made his first tire by wrapping a piece of hose around a wheel.

Of this yarn, Dunlop stated:[9] "The hose pipe story is childish. The material is so inelastic that it would be incomparably slower than a solid tire."

Another story which quite often bobs up is that Dunlop's son was an invalid, and the tires were designed for his comfort when, in truth, the boy was robust and possessed of the same mania for speed as the ten-year-oid of today.

In August, 1888, Dunlop ordered two air tubes and rubber covers from the Edinburgh rubber firm of Thornton & Co., but the order was refused with the statement that it was the most impractical idea of which they had ever heard. The Belfast agent of the firm soon set his principals right, and the air tubes were duly made, thus correcting Dunlop's doubts as to whether reliable tubes could be made easily. Meanwhile a bicycle without wheels had been ordered: Edlin made steel rims and when the tube arrived, Dunlop fitted them, using the best yacht sailcloth he could buy for the covers. The cycle was ridden for more than 3,000 miles. The front tire, which was never punctured or removed from the rim, is on exhibit today in the Royal Scottish Museum in Edinburgh. The rear wheel of the machine was lost while on loan for legal purposes in Paris.

(Portrait of Thomson was taken from "The Early History of the Rubber Industry," by B. D. Porritt, London, 1931. *The other three illustrations are from "The History of the Pneumatic Tyre," by J. B. Dunlop, Dublin,* 1924.)

(To be concluded)

[8] British patent No. 4,116, granted in 1889.
[9] Communication from Jean McClintock, Mr. Dunlop's daughter.

Editorials

Horse Sense and Hard Work for Prosperity

IN *Nation's Business* for July, 1938, Merle Thorpe said "Business may respond temporarily this fall to government spending, but, in the long run, business will not get better, nor jobs increase, nor standards of living stop falling, unless America returns to the old-fashioned common horse sense for which our people were once famed."

Everyone really knows the fundamental law of economic progress: that it is impossible to get something for nothing; that national wealth, which means individual wealth on the average, cannot be conjured up, but to be tangible must be produced not by manipulation, but by hard work.

Unit income for the individual can be increased by artificial means, but unit outgo will likewise increase; and if the artificial means employ inefficient expenditures, taxes must then increase beyond the previous proportion, thus resulting in a lower net financial income to the persons who constitute a nation. The material advancements which have contributed to the joy of living, many of which have been created on the more recently settled continents, have been due to the pioneering spirit and the will to work. The use of horse sense results in a realization of what is necessary and possible, and hard work produces practical results. When both are effectively applied, great odds can be overcome.

Very few, if any, doubt that prosperity and the contentment which accompanies gainful labor will again be with us. The important and perplexing question is, "When?" In terms of time, the question cannot now be answered. In terms of conditions, a continuing recovery will come into existence just as soon as these requisites are recognized and the country as a whole puts its shoulders to the wheel and builds tangible wealth through the medium of capital goods with a continuous program following fundamentally sound economic and social principles. The practices of now spending our future income and selfish grabbing must give way to a united industrious plan of conservation and production.

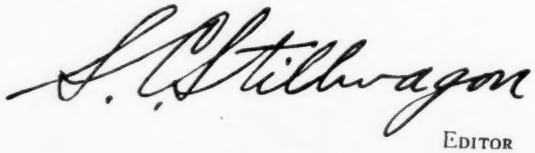
Spurred on by hopes for increased activities and anticipating usual conditions at the time of an upturn, the consuming industries are now showing greater buying interest, and in some cases greater production schedules are being started. Encouragement and magnification of this trend can be effected if common sense and a national spirit are followed by governmental agencies, organized labor, and business organizations. Some commodity prices have advanced, and product prices are being discussed. Just because there is a prospect of greater volume of business should not be an excuse for raising prices. Higher costs do not accompany increasing production if the unit labor cost remains the same. If the contributing agencies are content with increased volume and reduced unemployment and do not attempt to raise costs or selling prices, then recovery will continue and accelerate.

There is a desire for and a need of more goods. Inventories, while still somewhat high for present business conditions, are not too large for the potential volume which will become actual when people are assured of a continuous application of the principles of thrift, unbiased consideration, and sound reasoning. The effect of the present lending program is questionable because, in view of the indefiniteness of the future, individuals and corporations are wary of increasing their indebtedness. Large scale spending will have a temporary increasing effect on business, but it cannot carry on indefinitely, and unless a sound basis for confidence is established in the interim, general business will again drop off with the spending.

The Understudy

FROM the viewpoint of the ambitious person as well as the company, it is desirable that each individual be acquainted with some position in addition to his own and having greater possibilities. Promotions often come when least expected to those who are prepared and who in turn have an understudy who can take over their work. Success can be gained best by the man who is continually studying three jobs: first, his own; second, one of greater importance so that he may be ready if the opportunity comes; and third, one of lesser responsibilities in connection with the instruction of his own understudy.

In some instances men have been considered for better jobs, but have failed to get the promotion because no one was available who could take over their duties. As well as seeking from above, of equal importance is the passing down of information to those who are capable of moving up when the occasion arises. The fact that co-operation and help are being given to others is generally considered as a strong indication of deserving promotion. Likewise, in the case of supervisors, exceptional capability by those beneath, reflects to the credit of the one in charge, and any efforts to inform and build up the personnel are rewarded through a better departmental showing.



EDITOR

What the Rubber Chemists Are Doing

Milwaukee Rubber Meeting Canceled

The Executive Committee of the A.C.S. Rubber Division has announced that the divisional meeting originally scheduled to be held during the regular fall meeting of the American Chemical Society in Milwaukee will not be held this year. This action has been taken because only three papers were submitted for presentation.

It is hoped that the necessary cancellation of this meeting because of the lack of papers will stimulate the membership of the Rubber Division to greater activity in the preparation of manuscripts and that the members will give serious consideration now to the planning of material for presentation at the spring meeting which is to be held in Baltimore. The election of officers for 1939 will be conducted in September by mailed ballots.

Flexible Synthetic Resin

Basically polyvinyl alcohol, Resistoflex PVA is a flexible synthetic resin, resistant to organic solvents and oils, for tubing, gaskets, washers, packing, and sheet material. The new resin, used in European countries for a number of years, has a high degree of elasticity, flexibility, and toughness; it has a specific gravity of 1.26, is not inflammable, and may be used in temperatures ranging from —55° F. to +270° F. Resistoflex will not crack or check and will harden only slightly upon aging a number of years. Although not highly resistant to water, the resin is unaffected by the small quantities of water present in oils or solvents.

Solvent-immersion tests on Resistoflex PVA, each test extending over a period of 120 days, gave the following results: the resin was unaltered by gasoline, benzene, toluene, xylene, ether, acetone, methylene dichloride, chloroform, carbon tetrachloride, and carbon disulphide; slightly dulled by traces of water in the alcohol, but otherwise unaltered by ethanol, methanol, and isopropanol; practically unaltered (slight loss in elasticity) by methyl acetate, ethyl acetate, and isopropyl acetate; practically unaltered (measurable shrinkage 3%) by ethyl acetoacetate; practically unaltered by blended fuel (66 parts of benzine, 24 parts ethanol, and 10 parts benzene). Swelling tests for 144 hours in hot oil showed that the resin is practically unaltered (negligible shrinkage) by mineral lubricating oil at 250° F. or kerosene at 165° F.

Rubber and Plastics—New Committee Formed by A.S.M.E.

That applications of rubber and plastics are rapidly forging ahead is clearly evident from the attention now being devoted to these materials. Indicative of the trend, the American Society of Mechanical Engineers, 29 W. 39th St., New York, N. Y., recently established a committee, or subdivision, on rubber and plastics which will deal with several phases of the rubber and plastics industries including mechanical applications, research on basic mechanical properties, processing equipment, and standards. Activities of the group will be beyond the normal range of other professional organizations in an effort to fill the present conspicuous gap in the mechanical field.

The committee will sponsor the presentation of papers at technical sessions of the regular quarterly meetings of the A.S.M.E. A symposium on rubber comprising four invited papers covering the history of rubber, synthetic substances with rubber-like properties, fabrication of rubber parts, and certain mechanical properties of rubber is included in the program of the next meeting of the society to be held at Providence, October 5 to 7. Participation in activities of the committee will not be restricted to members of the parent society.

Authors of papers believed suitable for presentation at subsequent quarterly meetings should communicate at least four months in advance with Dr. J. F. Smith, Edward G. Budd Mfg. Co., 25th St. and Hunting Park Ave., Philadelphia, Pa., secretary of the rubber and plastics committee; or with the chairman, Dr. F. L. Yerzley, E. I. du Pont de Nemours & Co., Inc., P. O. Box 525, Wilmington, Del.

Reodorants for "Thiokol"

Owing to the steadily increasing use of oil and chemically resistant rubber substitutes, there has been a steady demand for aromatic materials which would overcome the pungent residual odors of these so-called synthetic rubbers.

Within the past few months Givaudan-Delawanna, Inc., with the assistance of Thiokol Corp. has made extensive compounding tests to determine the effect of reodorants on "Thiokol" DX. Theorizing with odor combinations is unsatisfactory because the union of two or more odors usually produces a resultant odor entirely different from what is expected. Because of this and the variation in individual desires as to odor the development of the use of reodorants becomes largely one of actual trial.

About 35 different aromatic compounds and blends were incorporated in a typical "Thiokol" compound, using "Thiokol" DX consisting of:

"Thiokol" DX	100
Zinc Oxide	8
Gastex	60
Altax	0.10

The odor of "Thiokol" was the only odor to be reckoned with. Concentrations ranging from 0.05% up to 0.25% on the weight of the "Thiokol" were employed. The samples were cured at 280° F. for 50 minutes.

In this group there were found to be four products which did a good job in modifying the characteristic "Thiokol" odor and imparting a new odor, generally considered to be more pleasant than the "Thiokol" itself.

As a general rule, irrespective of price, a concentration of 0.15% on the weight of the "Thiokol" content gave the best results in the estimation of most persons. The choice rests with the type of odor that the individual customer thinks most appropriate for his particular compound and the use for which the finished product is designed.

Boston Group Outing

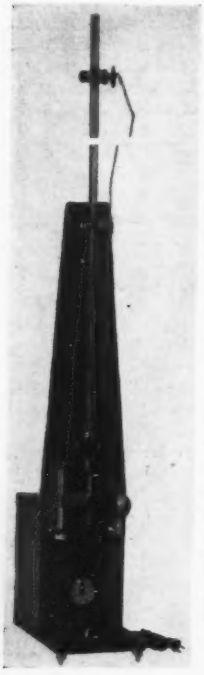
The Boston Group, Rubber Division, A.C.S., will hold its annual outing at the Weston Country Club, Weston, Mass., on August 19. Conveniently located eight miles west of Boston, the Weston club has one of the sportiest and most scenic golf courses in New England, with an excellent club house and facilities for entertaining non-golfers. Tennis, bowling, soft ball, and horseshoes are a few of the activities on the program.

A large array of prizes is assured, including those for winners in the sporting events, door prizes, and prizes for the tallest, shortest, fattest, thinnest, etc. After dinner, which will be at 7 p.m. and will cost $2, there will be a surprise entertainment about which the committee now refuses to disclose details.

New Machines and Appliances

Particle Size Analyzer

THE Palo-Travis particle sizer is a new instrument for determining particle sizes below 44 microns or 325 mesh down to 2 microns such as are encountered in the products of colloid mills and other fine-grinding equipment. The new apparatus, which is adaptable to plant control work, operates on the principle that dispersed particles, of dimensions exceeding colloidal size, in a confined fluid medium tend to settle under force of gravity, and the rate of sedimentation is the means of measuring particle size.



Palo-Travis Particle Sizer

The instrument consists of an oak support upon which is mounted a large glass tube giving a height of fall of slightly over one meter. A mixing chamber to hold the sample is connected to the large tube by a stopcock. Connected to the base of the large tube by means of a rubber stopper is a sedimentation measuring tube, graduated in millimeters, with a micrometer eyepiece for determining fractions of a millimeter. At the right of the measuring tube is an illuminating unit and a small electric tapper which serves to level the settled material. An electric stop-clock is located in the base. It is supplied for either A.C. or D.C.

The sample to be analyzed is placed in the mixing chamber from where it passes into the long glass tube filled with distilled water in the case of water-insoluble particles and kerosene for water-soluble particles. If the material cannot be readily wetted by the liquid medium, a wetting agent must be added. The specific viscosity of the liquid medium in relation to water must be known. The height of the sediment in the small tube is read at definite intervals. From these values of height and time the radius and the size of the particles are calculated. Colloid Equipment Co., Inc.

Variable Speed Control

FLUID pressure control is a new type of automatic and remote control for use with the Reeves Vari-Speed Motodrive,[1] a unit combining a driving motor and variable speed mechanism. The new control can be used: for automatically regulating mechanical speed from pressure variation as in a stoker feed on a boiler; for maintenance of constant fluid pressure in a pipe line or tank upon which there is variable demand; for providing uniform tension between machine sectors; and for similar requirements involving automatic speed control.

The complete control comprises a bellows shifting mechanism mounted on the Motodrive as illustrated, an adjustable pressure reducing valve located where desired, auxiliary valves, and connecting pipes. Fluid pressure is transmitted by means of oil, water, steam, gas, or air to the bellows shifting mechanism which operates to increase or decrease the speed on the Motodrive and hence on the driven machine. Speed of shifting depends on the kind of fluid used; air is the fastest.

The bellows shifting mechanism is simple in design, compact, and consists of the following basic parts: (1) a flexible metallic bellows connected with a special thrust bearing housing on the constant speed shaft and (2) a spring, inside the bellows. When the fluid pressure is increased, the bellows and spring become compressed, the sliding disk on the motor shaft is changed in position accordingly, and the output speed of the Motodrive is increased. Reeves Pulley Co.

[1] India Rubber World, Sept., 1937, p. 63.

Stiffness Gage

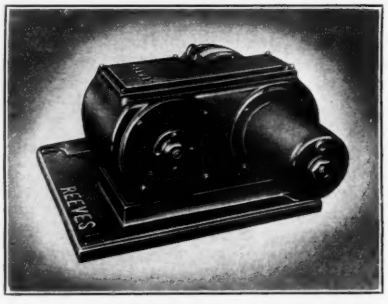
A PRECISION-BUILT instrument, known as the V-5 stiffness gage, accurately measures the stiffness and resilient qualities of paper, light metallic sheet, and rubber goods such as sheeting up to ⅛-inch in thickness, latex-impregnated fabrics, and rubber-coated fabrics of various types. The instrument's weighing system is of the pendulum type; the face of the specimen clamp is mounted exactly on the center of rotation, insuring constant length of the moment arm. When the load is applied to the free end of the test specimen by manual rotation of the loading disk, a torque is imposed on the holding means that is weighed by the deviation of the pendulum from the vertical. The initial stiffness reading is indicated when the pendulum inset coincides with the black line on the loading dial. Owing to elastic fatigue the stiffness starts drifting lower, and when a state of equilibrium has been reached, another reading is taken which is designated as the normal stiffness. A numerical expression for the resilient quality of the material is given by the ratio of normal to initial stiffness expressed in percentage. Taber Instrument Co.

Air Dusting Gun

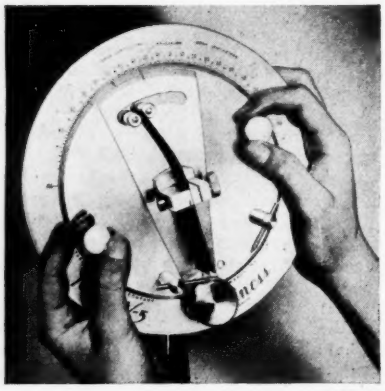
A COMPACT air dusting gun for cleaning by air pressure comprises a zinc body, a removable brass nozzle, and a one-piece thumb button which

(*Continued on page* 50)

Compact Air Duster



Motodrive with Fluid Pressure Control

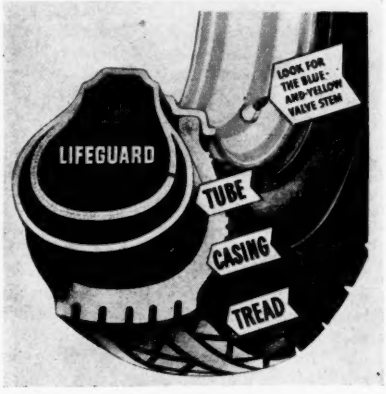


Stiffness Tester

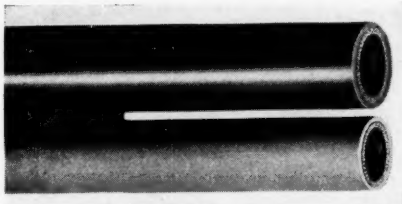
New Goods and Specialties

Safety Inner Tube

THE LifeGuard, a two-ply reserve tire within an inner tube, provides temporary support for the automobile in the case of a blow-out. The LifeGuard is joined integrally with the rim section of the inner tube in which it floats freely. A vent hole in the reserve tire permits air to pass from the inner chamber to the outer chamber, thus equalizing the pressure, so that in ordinary service the LifeGuard is under no strain. When a tire failure occurs, the air escapes from the outside chamber at once, but can escape from the inner chamber only through the single small vent hole; thus the LifeGuard converts a sudden failure into a slow leak. Goodyear Tire & Rubber Co.



LifeGuard, Inner Tube, and Tire



Siameez Hose

Dunlop Cow Boot

Paint-and-Air Hose

SIAMEEZ hose for spray painting consists of a red-covered rubber air hose joined by an integrally-molded web to a black-covered paint hose having a "Thiokol" tube which resists the effects of turpentine, naphtha, and other solvents used in paints and lacquers. Each hose is reenforced by two braids of cords; while both covers are of rubber. Electric Hose & Rubber Co.

Rubber Boot for Cows

A SEAMLESS rubber boot for cows, designed for use in the cure of foot diseases, enables dressings and poultices to be kept in place during treatment of the foot. The boot contains ventilation holes in the rear, is easy to put on, and cannot be removed by kicking. Tests have indicated that the new boot causes no trouble to the animal. Dunlop Rubber Co., Ltd.

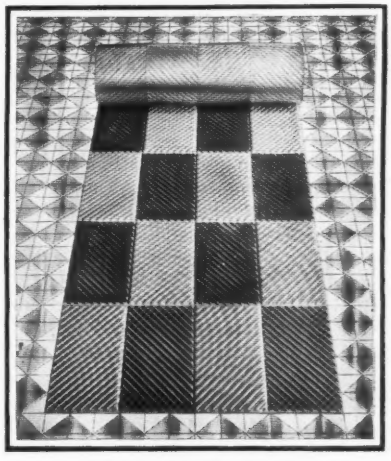
Heavy-Duty Rubber Rug

A NEW molded rug, Rub-O-Rug, made entirely of rubber, consists of a base approximately ⅛-inch thick and a wearing surface of double ridge units, approximately $\frac{5}{16}$-inch high. The new rug, adaptable to any floor space, is made in one-piece strips, in lengths of 5, 10, 15, 20, 25, and 30 feet. It is 54 inches wide and $\frac{5}{16}$-inch thick and weighs 1½ pounds per square foot. The upper surface of the rug is made up of 9- by 15-inch panels upon which the double-ridge units are arranged diagonally; the direction of the units are reversed in alternate panels to give a two toned shading effect. It is claimed that Rub-O-Rug will stand considerable wear and that the rubber ridges will effectively clean shoes of dirt and mud. Rugs are made in three colors: red, green, or black. Wear-Proof Mat Co.

Rubber Putty

PLASTIKON rubber putty, a development of The B. F. Goodrich Co., is a new type of putty and caulking material. It does not become brittle upon solidifying and therefore will withstand severe vibration. As it adheres firmly to steel, glass, and wood, Plastikon may be used generally as a steel and wood sash putty. Because of its high rubber content, the putty affords great resistance to moisture. Thus it can be successfully used for tile or marine caulking and as an aqua-

Applying Plastikon to Skylight Sash



Rubber Floor Covering

rium cement. Its resistance to corrosive chemicals and fumes makes it suitable for use in laboratories for sealing cracks and luting acid lines.

The accompanying photograph is a view of a new automobile assembly plant of the General Motors Co. of Mexico where, owing to the absence of cracking or brittleness when exposed to the extreme heat and dryness encountered in this territory, Plastikon putty was used for glazing the steel sash in the saw-tooth roof. Another successful application of this material was in the caulking of the steel-frame windows and tile roofs in an alkali

plant. Other materials used for these purposes had been unsatisfactory under the corrosive influence of the alkali.

Rubber Ski Ring

A NEW type of ski pole ring is made of rubber, molded to fit the pole shaft and compounded so as not to become brittle when cold. The outside circumference of the ring is reenforced with a steel band; while the spokes are left flexible so that the pole will assume any desired angle on the snow. It is said that the rubber wears extremely well on snow and ice and has less tendency to freeze to snow than other materials. Tests show no undue strain on the rings under a dead weight of 1,200 pounds per pair. Gerber Bros.

"Thiokrene" Ignition Cable

A NEW high-tension ignition cable, "Thiokrene," without braid or other outer covering is made with "Thiokol" insulation. Tough and elastic, the new patented cable is said to be resistant to corona, oil, and heat. Okonite Co.

Latex Overshoe

THE Drench Shoe, a new trim-fitting and light-weight overshoe for women, is made of stretchable latex. Each shoe weighs only slightly over an ounce and may be stretched to many times its size without tearing, a quality which has permitted limiting the number of sizes to three, which cover the range of women's shoe sizes from 3 to 10 inclusive. When not in use, the new overshoes can be rolled up in a transparent Pliofilm case and placed in an ordinary handbag. Richards, Boggs & King Inc.

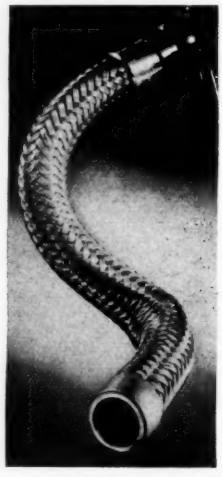
Rubber Tile Flooring

LIGHT-WEIGHT, fire-resistant rubber tile flooring, designed for railroad cars, buses, boats, and airplanes, has a canvas-reenforced back and solid inlaid colors in a variety of designs to match interior color schemes. After the inlaid colored rubber pieces are in place, the flooring is vulcanized to produce a sheet material with a seamless surface. Made in sizes to fit the floor space to be covered, the new flooring is available in three thicknesses: ⅛-, 5/32-, and ¼-inch. The Manhattan Rubber Mfg. Division of Raybestos Manhattan, Inc.

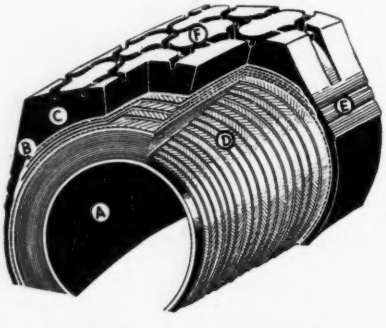
Retreadable Truck Tire

THE Denman retreadable truck tire has been developed to meet the hard requirements of present-day trucking and still remain in good condition for retreading. The destructive factors, heat and overloading, were given main consideration in the design of this tire. Referring to the accompanying illustration, the main features of construction, according to the maker, are as follows: (A) a red inner shock pad of heat resisting rubber prevents tube friction, adds resilience, gives extra ply strength, and guards against sidewall breaks; (B) breaker plies of long staple, special twist cotton are surrounded by heat-resistant cushion rubber; (C) tough tread rubber with high abrasion resistance; (D) fabric for plies utilize low-stretch, rubber-impregnated cords, separated by heat-resistant rubber; (E) a heavy thickness of sidewall rubber, protected by heavy ribs, prevents curb gouging and external breaks; (F) non-skid tread sign. The new tire, according to the manufacturer, uses no reclaimed rubber and can be retreaded or recapped more than once. Denman Tire & Rubber Co.

Ski Pole Ring



Flexible Hose Nozzle



Cross-Section of Denman Truck Tire

Hard Rubber Filter Plates

FILTER plates are made of especially compounded hard rubber, which is said to be tough, non-brittle, and exceptionally resistant to corrosive liquids and high temperatures. Able to withstand high pressures, the new plates will not warp when subjected to high temperatures. An indication of their toughness and non-brittle character may be gained from the fact that they have been tested by being dropped from the third story of a factory building without breaking. American Seitz Filter Corp.

Gasoline Hose Nozzle

A FLEXIBLE nozzle, comprising a bronze wire sheath braided over a hose made of Neoprene, has been developed for gasoline pump hose to meet a need resulting from the curved filler pipes on some of the newer automobile models. The new nozzle will adjust itself to the curves of the filler pipe and follow the pipe down to the gasoline tank itself. The high tension of the bronze wire braiding is said to prevent flattening of the tube when being bent, and the bronze sheath also affords a ground for static electricity. McGraw-Pennell Co.

Anti-Slip Footwear

PREVENTION of slipping on snow or ice is accomplished by a device[1] which consists of sectional metal strips with protruding spurs and can be inserted in elongated depressions in the tread surface of leather or rubber footwear. The metal strips are sectional and may be readily removed when protection against slipping is not required or when the strips must be replaced because of worn spurs.

[1] U. S. patent No. 2,122,867.

New Machines

(*Continued from page* 48)

actuates the air valve. High or low pressures may be used in operating the duster, which is easily done by closing the hand around the gun and squeezing the thumb button. Upon release of hand pressure, a spring closes the air valve. Among its uses are: blowing chips, dust shavings, etc., away from metal and wood-working machines; assisting in the evaporation of solvents; cleaning and dusting various equipment; final cleaning of surfaces before painting or finishing. DeVilbiss Co.

Rubber Industry in America

EASTERN AND SOUTHERN

A RECENT report reads that the approach of the third quarter finds sentiment improved; yet business activity continues at a very low level. For the past few months a strong resistance has been offered against deflationary forces and an upturn has taken place in the security markets as well as in some classes of speculative commodities. Inventories in most lines, while still high in relation to current demand, are below the high point of 1937, and continued reduced operating schedules should effect further reductions. Barring unseen developments, it would seem that business is scraping bottom and that a basis is being laid for a moderate improvement during the fall. Any sustained advance, though, depends upon a revival in the durable goods industries which, in turn, will be determined largely by the ability and the willingness of business enterprise to make long term commitments.

Factory employment and payrolls continue to drop, with sharp declines recorded for several major industries.

Steel mill activity has advanced somewhat and is now about 37% of capacity. Demand from all industries continues slow. Orders from automobile manufacturers are in low volume, but some business has already been received for 1939 models, and this type of business is likely to show a considerable increase the next few months.

Prices of finished cotton goods have been slowly rising, but are still on an unprofitable basis. Activity at cotton textile mills remains steady in the face of seasonal downtrend.

Leather shoe plants, which have already begun their fall run, have been expected to be operating in full force during July and August. For the first five months of 1938 aggregate production of footwear totaled about 155,000,000 pairs, a decline of nearly 22% below the record figure of a year ago.

It is predicted shoe output will be greater in each of the remaining five months of this year, compared with corresponding months of 1937. June output was estimated at 30,000,000 pairs, 12.9% under June, 1937, the smallest year-to-year decline this year. June production was below that of May, but the drop was less than seasonal.

Trade observers feel the steady growth in shoe operations reflects the liquidation of the heavy inventories piled up in the first part of 1937 by both manufacturers and retailers.

One of the few bright spots, however, of the present industrial picture has been the comparatively good showing of the building industry.

The petroleum industry has benefited in recent weeks from the seasonal increase in gasoline consumption and the decreased rate of crude petroleum output. Gasoline prices have firmed in the main midcontinent area.

New R.M.A. Regulations for Rubber Transactions

A new set of rules and regulations, effective as of August 1, 1938, which covers transactions between sellers and factory buyers of crude rubber in the United States has been adopted by The Rubber Manufacturers Association, Inc., 444 Madison Ave., New York, N. Y., and endorsed by the Rubber Trade Association of New York, Inc., 95 Broad St. These rules and regulations supersede those effective since 1928 and embody revisions based on experience gained under the old rules. Printed copies of the new regulations including a sample contract form may be obtained from the R.M.A.

Burlap Wrapping for Cylindrical Goods

"Tite-Fit Tubing" is the name of a new burlap wrapping for rubber hose, belts, wire, matting, sheeting, and other goods which are shipped in cylindrical form. The new wrapping is made from 7½-ounce burlap, cut on the bias and sewn together to form a tubing. The resulting diagonal direction of the weave permits longitudinal stretching or contraction of the tubing so that any one tubing size will tightly fit packages of several different sizes. For example, tubing made from 40-inch burlap will fit rolls with diameters ranging from 13 to 21 inches.

Left, Hand-Sewn Wrapping; *Right*, Tite-Fit Wrapping

To wrap an article the operator slips the tubing over the top of the package, fastens it with a wire tie at the bottom, pulls up on the sides to take out the slack, fastens with a wire at the top, and cuts the tubing off above the top tie. The saving in labor and also the material actually used is appreciable over methods which involve wrapping with flat burlap and sewing.

Binney & Smith Co., manufacturer, exporter, and importer of blacks, colors, clays, chemicals, and talc, 41 E. 42nd St., New York, N. Y., has announced that D. F. Wood, traffic manager for the past 21 years, retired on July 1, 1938. After a one-month vacation he will act as traffic consultant, being in the office one day a week. His successor is C. D. Macknee. J. D. Spruill was named assistant traffic manager, and G. Erath, chief clerk. A testimonial dinner attended by company executives and other friends of Mr. Wood was tendered him on June 30.

J. W. Snyder, of the Binney & Smith research and development department, who attended the recent London Rubber Technology Conference as co-author of one of the papers presented, returned to this country on June 30. Two weeks following the conference were spent in making calls to the paint and ink industries in the British Isles. Then Mr. Snyder visited briefly Belgium, Holland, and the Scandinavian countries, with business calls in Copenhagen and Stockholm. After two days in Germany and a detour through Switzerland, Mr. Snyder reached Paris, where he remained a week before sailing home.

Binney & Smith sponsored a golf tournament for employes on June 25 at the Innis Arden Country Club, Old Greenwich, Conn. First honors for low gross went to Philip Solomon; while Harold McNeill won the kickers' handicap.

Ajax Flexible Coupling Co., Westfield, N. Y., has reported through Vice President and Treasurer Wayne Belden that production has been increased 17% on its new line of Vibroplane and Angleplane screens. The firm manufactures couplings for standard and special applications, sieve shakers, mechanical vibrators, purifier sieve drives, screens, conveyers, and feeders.

U. S. Rubber News

United States Rubber Co., 1790 Broadway, New York, N. Y., on July 1 completed its refinancing program[1] with the retirement of its $50,000,000 of 5% first and refunding mortgage bonds. Funds for this purpose were raised from the $45,000,000 of new 4¼% mortgage bonds sold privately to large institutional investors. The balance on the old bonds and the retirement premium of $2,500,000 came from the company's own funds; no bank loans or other temporary financing were necessary. The company's long-term debt now consists of the aforementioned $45,000,000 bond issue, to mature in 1958; and the only other funded obligation is the $800,000 first mortgage on the U. S. Rubber building, to be paid off at maturity on January 1, 1939.

Factory Activities

United States Rubber Products, Inc., has appointed R. P. F. Liddell manager of the bicycle tire department to succeed the later Walter B. Harding, whose assistant he was for many years. Mr. Liddell also was manager of the retail merchandising, accessories and storage battery departments with headquarters at 1790 Broadway, where he will remain.

The company's Naugatuck, Conn., plant was shut down for its annual closing from June 28 to July 19 except in departments which had orders to finish first. According to Factory Manager Walter H. Norton, vacation pay would be given all workers employed from June 1, 1937, to June 1, 1938, totaling 2% of their earnings that year.

U. S. Rubber Products recently contributed $500 to the Charles Thomas McCarthy Student Aid Fund, organized by the Naugatuck Rotary Club in commemoration of Mr. McCarthy, who died April 25 after serving the rubber industry since March, 1889, chiefly in the Naugatuck footwear plants.

[1] For details see India Rubber World, May 1, 1938, p. 62.

Dr. Braak Shows Movies of Gutta Percha Estate

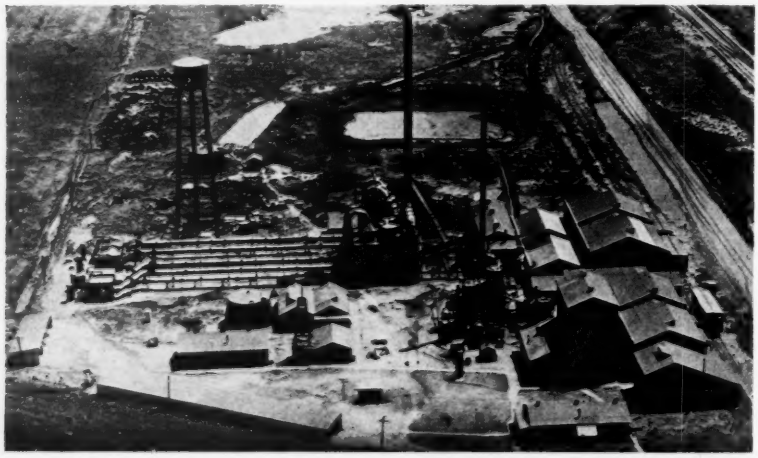
Dr. H. R. Braak, chief chemist and technical adviser to the Netherlands Indies Government Estates, and well known in the rubber industry, arrived in this country on the maiden voyage of the *S. S. New Amsterdam* and left on July 2 by the same steamer. He flew from Batavia to Amsterdam and will also make the return trip by plane. Dr. Braak made his headquarters in this country with the representative of the Netherlands Indies Government Estates for the United States and Canada, Jacobus F. Frank, 132 Front St., New York.

The object of Dr. Braak's visit was to renew his contract with the users of gutta percha of the well-known Tjipetir Estates, and he also investigated the paper industry in the South in connection with plans of the Netherland India Government to establish a paper plant in the pine woods of Sumatra, where a Naval Stores industry has already been developed. Dr. Braak also obtained estimates of American manufacturers for the equipment needed in Sumatra to build a paper plant.

On June 30, Dr. Braak showed an interesting moving picture of the Tjipetir Estate at the monthly luncheon of the Java Tiffin Club, at which many executives of the rubber and gutta percha industries were present. These pictures showed the gathering of leaves and twigs from the gutta percha trees and the factory separation of the gum by the special processes of the Tjipetir Estate.

Dr. Braak is recognized as one of the foremost authorities on gutta percha. At the London Rubber Technology Conference in May he presented a paper entitled "Durability in Connection with Gutta Percha and Balata."

Hewitt Rubber Corp., Buffalo, N. Y., has announced the recent elections of Wm. S. Carleton and Lester D. Bigelow as vice presidents and of Secretary Joseph H. Hayden as a director.



Air View of General Atlas Carbon Co. Plant at Pampa, Tex., Which Has an Annual Capacity of 15,000,000 Pounds of Gastex and Pelletex; Precipitators Are Shown in the Center of the Photograph

Meeting of Industrialists

Included among the speakers who addressed 125 southern industrial executives, gathered July 14 at Asheville, N. C., in one of a series of sessions devoted to human relations in industry were James S. Thomas, economist and president of the Clarkson College of Technology, Potsdam, N. Y.; and of Chrysler Institute of Engineering, Detroit, Mich.; and Cyrus S. Ching, director of industrial and public relations, United States Rubber Products, Inc., 1790 Broadway, New York, N. Y. The keynote of the address presented by Mr. Thomas is that the real concern today is not to curtail production, but to produce more and better goods.

He declared, "If it is said people cannot buy all the goods and services we now have, the answer is obvious. They are not good enough, not cheap enough. Once we make them twice as good and only half as expensive, we need not fear. There will be consumers."

Mr. Thomas further added that all civilizations have been industrial, for "There is no other way for them to exist. The only thing that distinguishes them is the technique. When civilizations are supported by simple manual techniques, masses of men labor long hours, have little, and culture is an aristocratic affair.. . . "

Mr. Ching told the gathering what executives can do to cement management and labor into such a relation that both will work for the common cause of industry and for the public good.

E. I. du Pont de Nemours & Co., Inc., Wilmington, Del., has announced the appointment of H. Belin du Pont as assistant to President Lammot du Pont to succeed the late B. Dorrance Beyea. The new appointee, who is a nephew of the organization's head, has been with the engineering department.

Bakelite Corp., 247 Park Ave., New York, N. Y., has reported that on June 15 the Bakelite Travelcade was installed at The Franklin Institute, Philadelphia, Pa., where it will remain the rest of 1938. The exhibit, "Modern Plastics for Modern Living," opened at the New York Museum of Science and Industry early this year, then engaged in a city-to-city tour of New Jersey. In 31 booths is shown the development of Bakelite plastics for every walk of life.

Endicott Johnson Corp., footwear manufacturer, Binghamton, N. Y., it is reported, has placed 20,000 workers, on a three- to four-day week schedule since last August, on a four- to five-day week.

Bibb Mfg. Co., manufacturer of cotton textiles, Macon, Ga., which had planned to shut down its mills throughout the state one week last month so that employes might have a vacation period, cancelled the plan because of a decided increase in business.

General Electric Co., Schenectady, N. Y., during the first half of 1938 received orders amounting to $128,223,823, against $217,265,619 for the same period last year, a 41% decrease, announced President Gerard Swope. Orders for the second quarter of 1938 totaled $62,847,423, compared with $111,518,589 during the corresponding quarter of 1937, a 44% decrease.

Lee Rubber & Tire Corp., Conshohocken, Pa., according to W. W. Benner, vice president in charge of manufacturing, is operating at full production, having gradually increased operations until it is now using three shifts daily on a five-day week. Lee is concerned almost exclusively with replacement tire business and has little or no trade with automobile manufacturers, buyers of original equipment.

Barber Asphalt Corp., 1600 Arch St., Philadelphia, Pa., to effect further economies will consolidate its Philadelphia office with its plant office at Barber (Perth Amboy), N. J. The transfer will be made this fall upon completion of an extension to the present plant office building. The new addition will be a two-story unit of reenforced concrete, brick, and tile construction, with a penthouse on the roof, including plumbing, heating, lighting, and air conditioning. The Barber construction department at Hunting Park Ave. and "E" St. and the roofing department warehouse at 122 Race St., both in Philadelphia, as well as the Pennsylvania sales personnel will not be affected.

National Association of Waste Material Dealers, Inc., Times Bldg., New York, N. Y., will hold its fall convention in San Francisco, Calif., October 17-19, the first time such an event will take place west of Chicago. Because of the elaborate plans being made, the association is now listing those who will definitely attend the convention from the East and the Midwest, and those in the trade, whether or not they belong to the N.A.W.M.D., are invited to register at headquarters in the Times Bldg. For additional information inquiries should be addressed there or to the N.A.W.M.D. Convention Committee, 16 California St., San Francisco.

PACIFIC COAST

The Desser Tire & Rubber Co., 6211 Cottage St., Huntington Park, Calif. On June 2 a fire started in the retreading department, which destroyed the office and warehouse, together with equipment and merchandise. The fire started from an arc of a motor, while men were working in the department. Loss was estimated at $80,000, which was partly covered by insurance. Irwin M. Desser, owner of Desser Tire & Rubber, reports that rebuilding will go

(*Continued on page 78*)

NEW JERSEY

PRACTICALLY all New Jersey rubber manufacturers report increased business, which is very encouraging after trade had dropped off to a large extent. While the gain in some instances was not very large, manufacturers feel no further decline will occur for the remainder of the year. Officials anticipate a rise in prices by late summer.

Jos. Stokes Rubber Co., Trenton, has let a contract for a new power house to replace its old one. New boilers, stokers, and other equipment will also be purchased, at a total cost of about $65,000. Milton H. Martindell, vice president and secretary-treasurer, was on a lengthy western trip.

Nearpara Rubber Co., Trenton, has experienced a growing demand for reclaimed rubber.

Puritan Rubber Co., Trenton, hired extra employes last month to keep up with increased production for rubber tiling and other mechanical goods.

Pocono Co., Trenton, finds business steadily improving, with better orders for rubber cloth.

The Thermoid Co., Trenton, now makes its tape and cloth products at its subsidiary at Charlotte, N. C. By closing this department at Trenton about 150 men lost employment. The Hamilton Township Committee, representing the territory where the workmen live, made every effort to have The Thermoid Co. continue the production at Trenton, but President Fred E. Schluter stated the change was made because of economy.

Acme Rubber Mfg. Co., Trenton, reports some improvement in all lines of production.

Arthur M. Youngs, president-treasurer, Youngs Rubber Corp., Trenton, and his three sons are spending some time at their summer home at Clayton, N. Y.

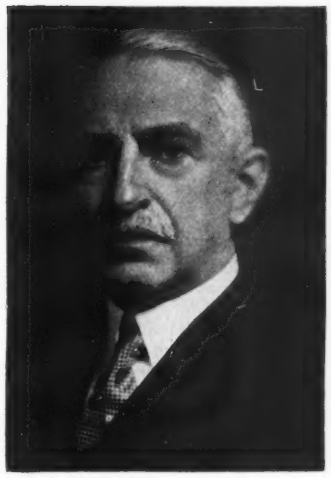
Mercer Rubber Co. officials, Hamilton Square, announce a general pickup in mechanical goods and expect business to make further gains.

Horace B. Tobin, former president of the Woven Steel Hose & Rubber Co., Trenton, N. J., has resigned as president of the board of directors of Mercer Hospital, Trenton. He served 16 years as president.

Pierce-Roberts Rubber Co., Trenton, finds business picking up, with increased orders for druggists' sundries.

Essex Rubber Co., Trenton, increased output during June and July, and further improvement is expected in late summer. Officials are optimistic over future business.

OBITUARY



Kaiden Studios, Inc.

Charles J. Butler

C. J. Butler

ANOTHER veteran of the rubber industry, Charles J. Butler, was taken by death, on June 25, at his home in Detroit, Mich. Private funeral services were held June 27, and entombment was in Evergreen Mausoleum.

The deceased was born in Worcester, Mass., May 1, 1862, but, when a child, was taken to Akron, O., where he attended the public schools.

For a time he worked for the National City Bank, Akron, but in 1890 the rubber industry won him over. He went to the Indiana Rubber & Insulated Wire Co., Marion, Ind., as general manager and later became secretary as well. Late in 1895, however, he threw his lot with the Seiberling Mfg. Co., bicycle manufacturer, Peoria, Ill., as secretary of the firm. Next he became secretary of the Peoria Rubber & Mfg. Co. For a time Mr. Butler was also associated with the Rubber Goods Mfg. Co. of New York.

In 1903 he became president of Morgan & Wright, rubber goods manufacturer, in Chicago, Ill., but was instrumental in moving the plant, in 1906, to Detroit, where it became later a part of the United States Rubber Co., of New York. In 1911 Mr. Butler was placed in charge of operations of four U.S. Rubber plants, at Detroit, Hartford, Conn., Providence, R. I., and Indianapolis, Ind. In 1913 he was recorded a vice president of the United States Tire Co., and ten years later, as a vice president of U. S. Rubber, he took charge of manufacturing activities of the tire division. Again, on April 17, 1924, he was elected a second vice president of the company. He went on the retired list January 1, 1930.

The banking business claimed his interest from his earlier years, and he served long as a director of the Highland Park State Bank, Highland Park Trust Co., and Crowley, Milner & Co.

(*Continued on page 68*)

OHIO

THE report from Ohio also is somewhat encouraging. Some gains are recorded in factory operations, and from one section comes the announcement that last month, for the first time since December, occurred a reduction in the number of unemployed.

Dependent on business revival is a spur in truck tire sales. With curtailed freight movement by trucks because of the current depression, machines not in use have been stripped of equipment, including tires, to be substituted for worn-out casings, etc., on vehicles still making runs. Such a policy, of course, has resulted in a potential demand for replacement of tires on trucks in use and also to reequip those in storage. Any important pick-up in general business should cause this demand to materialize. Unit replacement sales at retail of all types of tires so far this year have been considerably below 1937 figures, but truck tires were hardest hit.

The latest Dun & Bradstreet report indicates a poor showing for the rubber industry during January-May of the current year, especially when compared with the corresponding period of 1937. Slump in automobile production did not encourage prospects for sales of original equipment tires. Conservative estimates of sales to automobile manufacturers did not exceed 10,500,000 tires, against 22,700,000 during 1937, a difference of 53.7%. Sales of replacement tires were expected to go over the 30,000,000 units sold during 1937, (but it is not now believed possible).

Mechanical rubber goods, the demand for which was widening constantly, were being counted upon to offset some of the loss from diminished sales in other divisions. Many concerns in the novelty division were close to 1937 volume. Prices were approximately the same as a year ago.

By the end of June tire inventories were expected to be down to normal in relation to demand. Rubber footwear inventories were expected to be well in hand by mid-August. At the end of January inventories of automobile casings were only 3.4% smaller than on the corresponding 1937 date. The decrease rose to 12% in the February comparison; by the end of April was 18.3%, and the close of May the 9,855,360 units on hand were 21.7% fewer than those on May 31, 1937.

Entries under 77-B applications were entirely absent for the first five months this year for concerns in the rubber goods industry. For 1937 the annual total declined to a new low at two, going down from three for 1936 and four for 1935. With three recorded for 1934, number of 77-B cases since June, 1934, totaled 12. Of this total 11 were manufacturers.

First rise in failures in the rubber goods industry in eight years sent the number for the first five months of 1938 to 11. These nearly equaled the 1937 annual total of 15, which set a new low. Drop from the previous low to 26 for 1936 amounted to 45%. From the all-time high of 234, reached in 1928, the decline was 93.6%.

Complete insolvency record of the rubber goods industry from 1927 to May, 1938, as compiled by Dun & Bradstreet, Inc., shows:

MANUFACTURES
(Includes Automobile Tires, Rubber Goods, Footwear, Heels, and Soles)

Year	Number	Liabilities
1927	36	$2,950,000
1928	32	4,912,000
1929	24	2,971,000
1930	20	3,220,000
1931	27	2,067,000
1932	26	1,368,000
1933	29	2,067,000
1934	13	117,000
1935	11	243,000
1936	10	714,000
1937	5	28,000
1938*	5	69,000

WHOLESALERS AND RETAILERS
(Includes Automobile Tires, Rubber Goods, Footwear, Heels, and Soles)

Year	Number	Liabilities
1927	156	$1,172,000
1928	202	2,070,000
1929	121	1,480,000
1930	170	2,720,000
1931	206	3,863,000
1932	132	1,731,000
1933	75	1,100,000
1934	35	466,000
1935	35	271,000
1936	16	208,000
1937	10	138,000
1938*	6	32,000

(*) January to May inclusive.

These statistics of failures in the rubber goods trade are exclusive of applications under Section 77-B. From June 7, 1934, when Section 77-B of the New Bankruptcy Act became effective, to May 31, 1938, applications were filed by 11 manufacturers and one retailer.

Goodrich Announcements

About 200,000 automobile trailers are traveling the American highways this summer, according to a survey by The B. F. Goodrich Co., Akron.

Intended for installation on the giant 72-passenger transoceanic Boeing flying boat built for Pan American Airlines, the largest aircraft de-icers ever manufactured, have been fabricated by Goodrich. They required more than 310 square feet of specially processed fabric and rubber and were made in six sections, the longest of which is 20 feet.

De-icers for the tail surfaces of the big flying boat are approximately as large as those required for the wings of the present airline transport plane.

Tire Tread Research

The importance of tire tread design as a means of safety in motoring is apparent from the fact that Goodrich engineers spent two years of research in developing the "Life Saver" tread for the firm's recently introduced tire. Scrapping all previous conceptions of what an anti-skid design should be, they made exhaustive practical tests, and from these data built up their design.

For highway skid tests a two-wheeled trailer, coupled to a truck with a hydraulic dynamometer, was used. A calibrated recording device connected to the dynamometer registered the force of the pull. A sprinkler arrangement in front of the tire being tested was used to produce a wet pavement. A special brake on the test wheel was the means for determining the force needed to start a tire skidding. For straight-ahead skid tests the drawbar was attached directly in front of the test wheel, with the free wheel acting as an idler. For side-skid testing the drawbar was moved to the center between the wheels. The same two-mile stretch of highway was used for all tests.

First tests were made on a bald tire without a tread design; the results were used to weigh the effectiveness of all tread designs. From the results obtained on over 100 designs, in which bars of differing widths and running at various angles from the center-line were used, it was learned that the design with the greatest wet-weather skid-resistance

Truck and Trailer Used for Tire Tread Research

consisted of parallel bars running at an angle of 30° to the center-line; each bar was ⅓-inch wide, and the groove between bars, ⅛-inch wide. Non-skid effectiveness of this design comes from the action of the bars in wiping the water from beneath the tread, while the grooves provide efficient drainage channels through which the water is whirled. The final pattern that went into production included: diagonal bars running in both directions from the center-line; rounded corners to lessen noise; and addition of ribs at the shoulders.

After completion of the research program a glass topped turntable was devised upon which the tire was run. The tread action under different conditions of speed and braking was photographed through the glass from below the table, showing the results of the tire's action on a film of water.

Several general conclusions, applicable to all tires, were made from this study: (1) brakes should preferably be applied gently; (2) skidding is affected by types of road surface, speed, amount of moisture on the road, dust film, and filler between joints; (3) as speed increases, friction between tires and road decreases; (4) sole function of a tread in reducing skidding is to wipe the pavement dry; (5) effective tread design must provide for the quickest possible flow of water from under the tire.

Among the Personnel

F. L. Haushalter, Goodrich development engineer, on July 8 at the summer seminar on concrete and timber held at Massachusetts Institute of Technology, Cambridge, Mass., described rubber springs in a paper presented to the conference, attended by leading industrial and construction engineers and college professors. He stated the rubber devices have met wide success in machines ranging up to 500,000 pounds, prolonging the life of machinery and easing the strain on the nerves of workers. The speaker further declared the rubber mountings, called vibro-insulators, may eliminate as much as 90% of the vibration of machinery and extend the longevity of concrete structures in which the machines are housed. Unlike other substances, scientifically compounded rubber can be subjected to extensive distortions without "creeping" or setting excessively.

George M. Madole, for the past ten years assistant managing director of Goodrich, Colombes, France, has been appointed assistant to the general sales manager of the original equipment tire division of the Goodrich company, according to G. E. Brunner, general sales manager of the division. Mr. Madole, a member of the French Legion of Honor since 1935, joined Goodrich in 1910 in the experiment department, where he worked until 1917, when he went into the balloon and dirigible building departments, remaining there until after the close of the World War. Next he went to the tire division in 1919, then was sent to the French plant as assistant superintendent in 1920 and became works manager in 1923.

Award of Highway Safety Trophy

Goodrich presented its highway safety trophy to the Benevolent Protective Order of the Elks at its seventy-fourth annual convention in Atlantic City, N. J., July 10 to 14, in recognition of the successful national safety campaign conducted by the order during the past year. The trophy went to the Salt Lake City lodge for the local safety drive made there under the Elks' direction. The contest for the trophy was participated in by 1,500 Elks lodges.

Goodyear Activities

The Goodyear Tire & Rubber Co., Akron, has announced that practically all the 3,000 workers in Goodyear Clearwater Mills, its fabric subsidiary, at Cedartown, Cartersville, and Rockmart, all in Ga., have subscribed to a new group insurance plan which gives them more life coverage and also group accident and health, accidental death and dismemberment, and hospitalization insurance. They have had group life insurance in the Equitable Life Assurance Society for ten years, and it also furnishes the other coverages except hospitalization.

Trailer Carries Goodyear Products

Goodyear recently sent on tour a display coach carrying a complete line of tires, tubes, batteries, accessories, bicycle tires, and other company products. Specially built in Detroit, the white, blue, and yellow trailer is 27 feet long and seven feet wide, has Life-Guards in its ten 6.00-20 tires; while the Chrysler unit providing the transport power is equipped to make Life-Guard demonstrations en tour. The trailer floor has Goodyear Wingfoot flooring; the walls have wall rubber. Equipment includes public address system, sound slide and silent movie projection features. The coupling arrangement for attaching trailer and car to provide extra cushioning and easier riding consists of an inflated Goodyear tire set in the rear deck of the car, carrying a coupling arrangement which fits inside the diameter of the inflated tire.

First appearances of the products coach were in Indiana and Pennsylvania, and other states may expect visiting tours.

Goodyear Display Coach

Work to Start on Swedish Plant

Last month Goodyear sent several men to Sweden to get under way construction of the new tire factory at Norrköping. Among those who sailed were W. D. LaDue, Goodyear's ace plant constructor, who had accompanied President Paul Litchfield abroad when the Swedish site was selected; H. C. Hoch, construction engineer; Henry J. Fee, electrical engineer; F. J. Carter, to remain a preliminary period on efficiency and personnel; R. D. Wilson, to remain as personnel manager; C. J. Bassler, of Gadsden, Ala., to be secretary-treasurer; W. J. Meadows, power plant engineer; Steve Hunter, installation man; and I. S. Gharky, to remain as purchasing agent.

New Truck Tire Line

Goodyear recently announced a line of truck tires, known as the Marathon, which is comparable in quality with the previously introduced Marathon passenger car tire. The new tire, which enters the lower price tire field, is made in six sizes covering 85% of the market. The tread on the new Marathon is flatter with a new notched rib tread design; while the body utilizes fabric from low-gage, low-stretch cord and heat-resisting rubber compounds.

New Markings for Tire Repair Stock

After present supplies of red Holland are exhausted, it will no longer be used as identification on Goodyear truck tire repair material, because except for the company's tread repair gum, the color of stock is now sufficient identification for each type. Identification of the material follows: Wingfoot tread repair gum, black gum; truck tire tread repair gum, black gum with three red threads on the face of the gum; Wingfoot cord passenger repair fabric, yellow gum; truck cord repair fabric, pink gum; passenger cushion, yellow gum; truck cushion, pink gum.

Farm Essay Contest

Goodyear recently closed its essay contest on "Rubber Tires on Farm Tractors and Implements," announced late in May and open to all high school students within continental United States who were students of vocational agriculture or members of the Future Farmers of America. Winning contestants were announced July 15 after

more than 9,000 entries had been received, from every state except Rhode Island.

Winners of the 10 grand prizes will be brought to Akron on August 19 whence they will go by lake boat and automobile to Timagami, Ont., Canada, where they will remain a week as guests of Goodyear President Litchfield at his private island lodge. Also visited will be Niagara Falls, Toronto, Ottawa, and the Finger Lakes district of New York State as well as the Dionne quintuplets. All expenses from start to finish of each contestant's trip are included in the prize.

Writers of the next 25 best essays were awarded $25 each, in cash.

General Tire News

General Tire & Rubber Co., Akron, recently was visited by 40 Pure Oil dealers and distributers in the Indianapolis, Ind., area, who won the trip for having made high records in the sales of Yale tires, which are built at Akron under the supervision of General Tire engineers. Following inspection of the factory, the group was addressed by L. A. McQueen, General Tire sales manager; O. S. Johnson, of the General Tire sales department; H. W. Keuhne, of the Chicago office of Pure Oil Co.; and Sid Jensen, of General Tire in Chicago.

Dual 10 Tires in Safety Test

An outstanding annual highway safety event is the six-month traffic school held in Evanston, Ill., by the Northwestern University Traffic Safety Institute in conjunction with the International Association of Police Chiefs and attended by traffic bureau heads from the nation's leading police departments. Tests made in the nature of field work to supplement classroom instruction in highway safety are conducted by the institute officials together with police traffic authorities and representatives of the American Automobile Association.

One of the tests consisted of a demonstration of the ability of the new squeegee type of automobile tire tread to stop a speeding car, in its tracks, on a wet pavement. Used on a car driven by an instructor at the school and an AAA official were General Dual 10 tires.

On a level stretch of pavement, previously flushed with a fire hose, the car was driven at varying speeds, and the stopping distances were recorded by markers at regular intervals along the route of the test. In a typical test run, at 37 miles an hour, the car was stopped in 57 feet on wet surface, although the average distance required to stop a car on ordinary tires at this speed, on dry pavement, is 105 feet. The purpose of the tests was to demonstrate a formula taught police officers in the classroom to enable them to determine speed from skid-marks.

Tires for Sky-Trucking

General airplane tires are being used on large Curtiss Condor planes which transport heavy mining equipment into the South American Andes and thus permit the operation of otherwise inaccessible gold mines. The heavy machine parts are carried at $85 a ton.

As no roads exist between the Peruvian valleys where rail transportation is available, and the gold mines are high in the Andes, the cost of getting machinery into the mines and getting the ore out had been prohibitive. Then Hugh I. Wells, American pilot, landed one of his four Condors, transformed from bombing planes to commercial airplanes, on the beach of Lake Pias, 1,850 meters above sea level, with 3½ tons of mining machinery.

Today sky-trucking from Trujillo to the lake has become a daily achievement, and already more than 1,300 tons of machinery have been landed, regardless of weather conditions. The planes are equipped with oxygen, for the pilots soar to 15,000 feet over the Cordilleras and complete the trip, which formerly took almost a week, in an hour and ten minutes. All ships are equipped with General airplane tires, which are reported to have well withstood the severe tests to which they are subjected. The planes are also used for transporting passengers, mail, and other freight over the Andes.

Fifteen Years of Progress

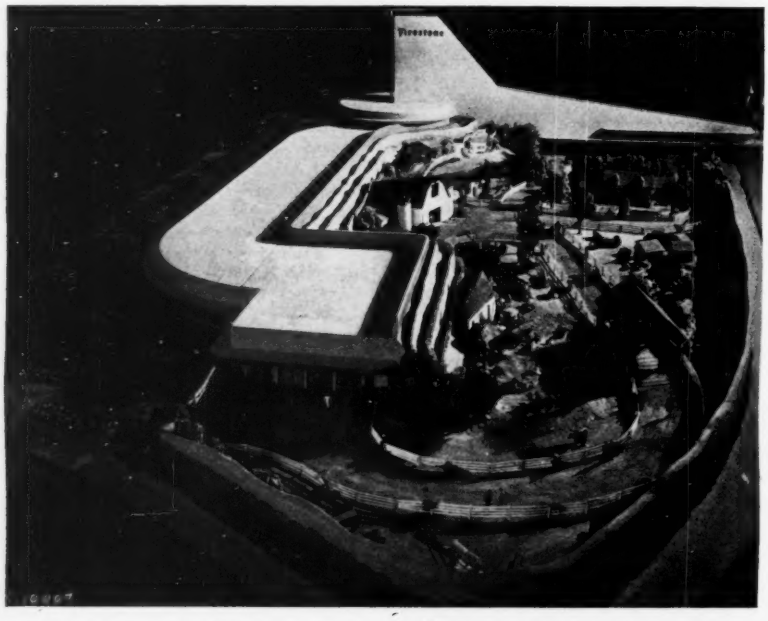
Firestone Anniversary

June marked the fifteenth anniversary of the introduction of the first balloon tire by The Firestone Tire & Rubber Co., Akron. Publicly announced at the June meeting of the Society of Automotive Engineers at Spring Lake, N. J., the first Firestone balloon came through production on April 5, 1923.

High-pressure cord tires then in universal use placed definite restrictions on certain phases of motor car development and utility. The mileage life was less than half that of the present-day balloon tire.

In a large measure the low-pressure balloon tire opened the way for later motor car advances such as: reduced stress and strain on the car, greater roadability and faster speeds, and four-wheel brakes. Because of this greater comfort and dependability the popularity of the automobile has increased to the point that today more than 26 million American motor vehicles are rolling on those balloon-type tires which first came into existence in the Firestone plants 15 years ago.

Firestone will hold its annual employes' outing on August 5 at Euclid Beach, with the usual entertainment, sports, beauty contests, etc.



Model of Firestone Exhibit for New York World's Fair, to Include a Full-Scale Tire Factory in Full Operation and a Life-Size Reproduction of a Farm

A. Schulman, Inc., Celebrates Tenth Anniversary

Alex Schulman

Ten years ago Alex Schulman decided to establish his own rubber brokerage firm. For more than 12 years previous he had been absorbing knowledge and facts about the intricacies of the crude and scrap rubber market. He felt that there were certain fundamentals that a brokerage firm must live up to if it were to long endure. He was positive that he must be able to guarantee uniformity in filling all orders, that exacting standards had to be observed, and that deliveries must be speedy. George Woloch, who was persuaded by Alex Schulman to drop his studies while a junior at Harvard, was selected as secretary and treasurer, in charge of sales. Much of the present success of the company is due to his untiring efforts during those early years. Doris Kushkin, with three years' experience in handling details in rubber offices, was selected as office manager. So these three, with definite ideas as to how a brokerage business should be operated, formulated their plans and set their principles. Their primary motive was to establish a sound reputation for honesty, integrity, and untiring effort in handling all inquiries.

With these objectives in mind, A. Schulman, Inc., started operation in one warehouse in Akron, handling crude rubber, scrap rubber, and hard rubber dust. As a result of rigidly adhering to the firm's original concepts, it soon became necessary to expand. Milton Kushkin, who was trained in the Akron organization, was appointed branch manager and opened an office and warehouse in East St. Louis, Ill. He is now rounding out nine years' service with the company. His experience, tact, and genial personality have won many friends for the Schulman organization.

In the meantime, the Akron Warehouse had been outgrown, and it was necessary to move to a new plant. The company now has one of the finest scrap rubber warehouses in the country, with siding facilities on both sides of the building so that 16 cars can be taken care of at one time. Further expansion demanded an office in New England, and Dave Lundquist, a native of Bridgeport, Conn., was sent to Boston. After eight years of experience with the company his thorough knowledge of Boston problems greatly aids the home office.

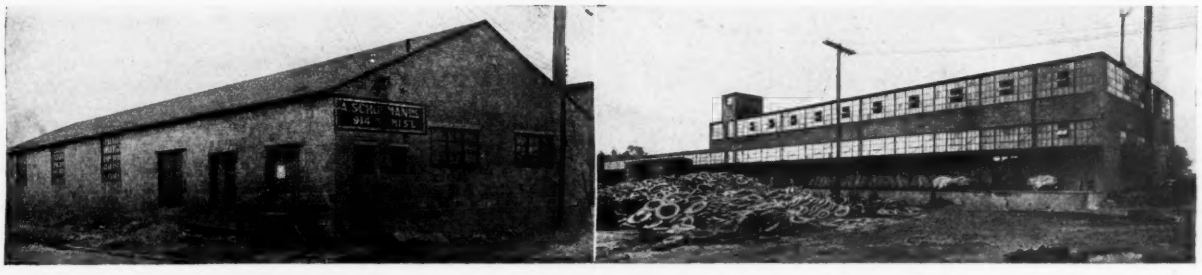
During this period of expansion outside of Akron, it was necessary to increase the home staff; so John J. Costello was brought into the organization. His 18 years' experience in all phases of the scrap rubber business has proved an excellent sales background. Samuel A. Tanney, with 12 years' experience in handling scrap rubber problems, then joined the sales force. His enthusiasm and hard work have also helped build the reputation of A. Schulman, Inc.

Ben Gordon, who is another addition, is now responsible for the purchases of scrap tires and tubes for reclaimers. Irving Schulman, after graduating from Wharton School of Business, joined the organization as a junior salesman. Frank Francis was added to the East St. Louis staff, where his thoroughness and pleasing approach have been of great assistance. James Christopher, graduate of Brown University, is using his former experience as a rubber chemist to assist on compounding problems.

A. Schulman, Inc., now buys and sells crude rubber, scrap rubber of every description, and hard rubber dust throughout the world and ships orders to all parts of the United States, France, England, Holland, China, Japan, South America, and Asia. Alex Schulman, founder and president, can well be proud of the accomplishments of his organization on this, the tenth anniversary.

Doris Kushkin

George Woloch



***Left,* First Akron Warehouse of A. Schulman, Inc.; *Right,* Present Akron Warehouse**

NEW ENGLAND

THE report from New England is that business has definitely improved. This rise, however, is from a very low level; and while part-time operations continue in most industries, output and employment have gained over the previous month.

New Latex Handling Plant Opened by Dunlop

A unique service was inaugurated on June 13 at the Army Base terminal at the Port of Boston when 65,000 tons of latex were pumped from tanks of the Dutch steamer *Weltevreden* direct to tanks at the Army Base. This new latex handling plant includes six 20,000-gallon tanks, with provision for two more at a later date, which were built into a special room by the Dunlop Tire & Rubber Co., Buffalo, N. Y., under the supervision of Engineer C. S. McChesney. The tanks are 33 feet long and ten feet in diameter.

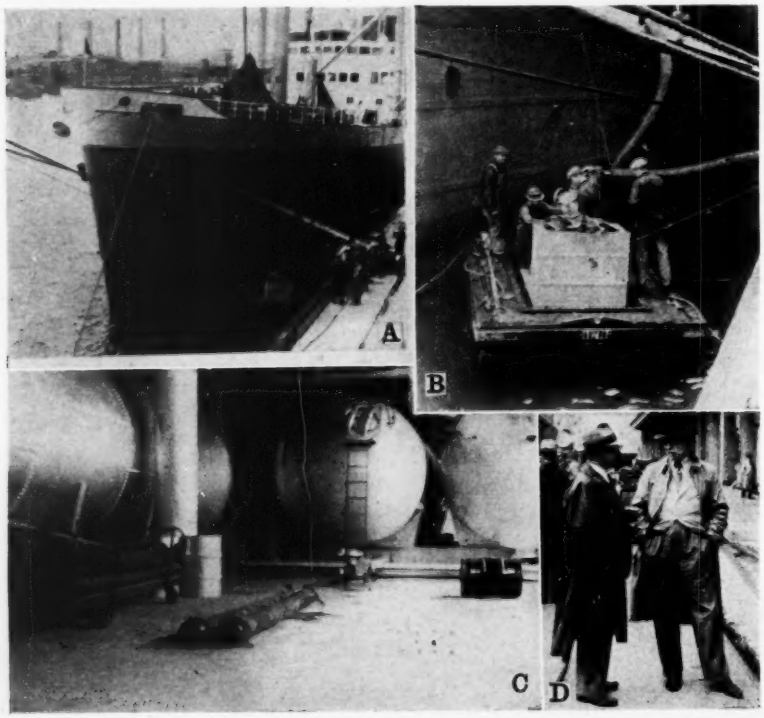
Pumping the latex from the Dutch steamer was at the rate of 400 gallons a minute, which will be increased as the system is adjusted. The latex, which is stored in the pier tanks, can then be transferred to drums for local delivery or to tank cars for inland transportation.

Boston is the only U. S. port having these storage tanks, according to H. F. Van Valkenburgh, Dunlop purchasing agent, who attended the initial event. He further declared the company contemplates no such installations at other ports.

Others present at the opening ceremony were George Orlowski, Jr., representing Charles T. Wilson Co., Inc., New York, N. Y.; Frank Ascoli, representing the Dunlop interests in England; Richard Baybutt, of Ernest Jacoby & Co., Boston, Mass.; J. B. Crockett, of Heveatex Corp., Melrose, Mass.; and E. J. Elwell, Vultex Chemical Corp., Cambridge, Mass.

New Vinyl Acetate Plant

Shawinigan Resins Corp., Indian Orchard, Mass., jointly owned by Monsanto Chemical Co., St. Louis, Mo., and Shawinigan Chemicals, Ltd., Montreal, P. Q., Canada, has completed its new vinyl acetate resin plant, the first of its kind in the United States. While the new product will be used chiefly in the manufacture of safety glass, many other uses are in the process of development in the research laboratories of Monsanto at Indian Orchard and Dayton, O., and of Shawinigan Chemicals at Shawinigan Falls, Quebec.



Unloading First Boat-Load of Latex at New Dunlop Storage Pier in Boston on June 13, 1938

A. Dutch Steamer "Weltevreden" at Pier; B. Pump and Hose Lines Conveying Latex from Boat to Tanks; C. Four of the Six 20,000-Gallon Storage Tanks; D. Frank Ascoli (Right) and Richard Baybutt (Left) at Inauguration of Service

Cabot Obtains Carbon Black Patents

On June 14, 1938, two United States patents, No. 2,120,540 and No. 2,120,541, on the manufacture of carbon black were granted to E. Billings and H. H. Offutt, assignors to Godfrey L. Cabot, Inc., Boston, Mass. Both patents are based upon the fact that by subjecting dry carbon black particles to multi-directional pressure and at the same time maintaining them in a state of turbulence, the particles agglomerate progressively into spherical granules. These granules, which have an apparent density of over 18 pounds per cubic foot, are tenacious in structure and have a relatively non-coherent and non-adherent surface. These patents disclose two different forms of apparatus used in producing carbon black in spherical granules.

Fisk Reports

A $39,000,000,000 saving to American motorists has resulted from the continual drop in tire and tube prices since 1920, according to Col. Charles E. Speaks, president of the Fisk Tire Co., Chicopee Falls, Mass. At the same time he pointed out that constantly greater mileage returns are being obtained despite increasing severity of service.

The savings, averaging more than $1,300 per car owner, represent the difference between actual amounts paid for tires and tubes and amounts which would have been paid if tire quality and price had remained at 1920 levels. Tire cost per 10,000 miles in 1920 was $163; today the same mileage is secured for about $39.

American tire manufacturers, Colonel Speaks declared, have spent $55,000,000 on research in the past ten years to bring about these savings and improvements, which include greater skid resistance, elimination of noise and vibration, and improved ride-ability.

Carrying Capacity Decreases as Speed Increases

A vital fact little known to truck operators is that carrying capacity of a tire steadily diminishes as speed increases. A 10-ply tire driven under 40 miles per hour has a 30% greater carrying capacity than the same tire driven at 55 miles per hour, Fisk engineers find. Tires are designed for normal speeds, depending upon specific uses, and if a rush load must be driven at excessive speeds, capacity should be reduced accordingly, they say. They further point out that capacity cannot be increased by overinflation. The contour of a tire is designed to give maximum service when used with a flexible carcass. Increased pressure reduces normal flexibility and in turn reduces the life of the tire.

Safety Plea

Colonel Charles E. Speaks, Fisk president, July 15 sought the cooperation of the 48 state motor vehicle commissioners in reducing accidents during the dangerous summer months. He suggested in a letter that the commissioners broadcast asking each driver to become a personal inspector of his own car, checking brakes, lights, and tires.

"A substantial reduction in accidents can be brought about," he said, "by arousing the motoring public to tire consciousness. More blowouts and flats, which may result in injuries and deaths, take place between June and October than all other months combined.

"If drivers will realize that the danger of outworn tires is doubled on burning summer roads, an important hazard will have been overcome," Colonel Speaks added.

Tread condition, he stated, is an excellent index of a tire's usefulness. When the tread is worn down, the tire is no longer safe and should be replaced.

Vultex Fire

Fire of undetermined origin caused substantial damage to the plant of the Vultex Chemical Co., 666 Main St., Cambridge, Mass., about 1:30 a.m., July 15. Building No. 2, which housed the development and research laboratory and a large amount of latex and Vultex storage, was practically a total loss. Buildings No. 1 and No. 3, which contained the manufacturing department, control laboratory, and chemical storage suffered only slightly.

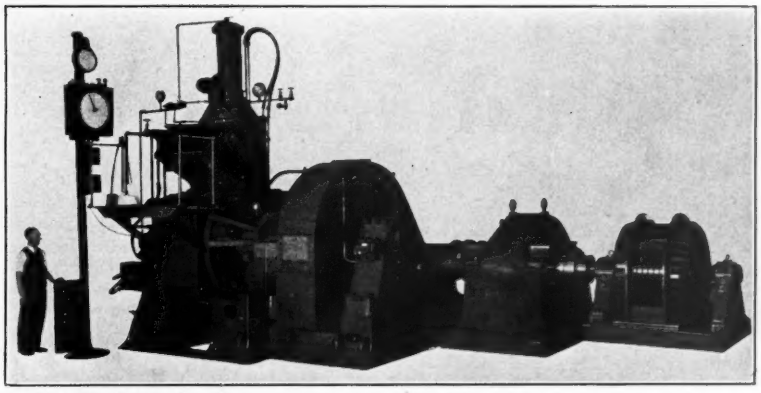
Emergency arrangements were immediately made for fresh supplies of latex and chemicals so that service to customers was not seriously impaired. Several shipments were made the day of the fire, and fairly extensive service resumed on Monday. Production was back to normal in four or five days. No customer was permitted to run out of Vultex. The development and engineering service provided for the benefit of customers may be temporarily delayed as a result of the destruction of the recently completed laboratory, but service is being supplied from temporary quarters.

Arrangements to rebuild are being made promptly, and construction has already been started. The cost of rebuilding and replacing the equipment and materials destroyed has not as yet been accurately determined. Figures between $75,000 and $100,000 have been suggested, but these are subject to revision.

Assistance offered by many friends in the recent emergency is very much appreciated by the Vultex Chemical Co.

Artificial Mica

Dr. Ernst A. Hauser, of the Massachusetts Institute of Technology, Cambridge, Mass., has recently found a way to make artificial mica from common clay. Mica is relatively rare; but clay, which is used to produce the new inorganic substance, is a plentiful material. Research is being continued on methods of producing these films as well as on their characteristics.



Farrel-Birmingham Co., Inc.

Size 11 Banbury Mixer with Two-Speed Motor

A. R. Lukens, secretary of the Boston Group, Rubber Division, A.C.S., and director of research, Thompson, Weinman & Co., Inc., 11 Windsor St., Cambridge, Mass., recently won the Alvan T. Fuller trophy at Massachusetts Institute of Technology for successful competition in 26 dinghy races held on week-ends during the early summer. These sailboat races are open to regular students, graduates, and staff of the institute.

Hot Breakdown in the Banbury

It is now common practice to break down rubber at higher temperatures than were permissible a few years ago. It has also been found that it is good practice to mix some classes of rubber compounds, such as master batches of carbon black and rubber, at higher temperatures than was formerly the custom. When the Banbury mixer is used for mixing or breaking down rubber at high temperatures, the cooling facilities provided in the machine can be shut off or regulated to provide higher temperatures. The thermocouples built into modern Banburys are much more sensitive than the thermometer used on earlier machines and consequently provide a much more reliable guide to the actual temperature of the stock.

With the hot breakdown method the temperature of the rubber is frequently as high as 400° F., and usually somewhere between 345° and 390° F. The combination of the high temperature and the intensive mechanical working to which the rubber is subjected at high speed results in a thorough breakdown in a very short time, and the plasticity is satisfactorily permanent.

The accompanying photograph shows a size 11 Banbury mixer with a two-speed motor so that the machine can be driven at the usual standard speed or at double the standard speed. Recent tests have shown that the Banbury mixer, when operated at double speed, does an excellent job of breaking down rubber and does it much more efficiently than at the slower standard speed. Proper precautions have been taken so that there need be no trouble with the bearings of the machine when it is used for high temperature operation.

MIDWEST

SIGNS of an upturn became more definite in the Midwest last month. Both retail and wholesale trades reduced declines. Factory operations, in several industries, furthermore, reported gains.

But further declines in employment and payrolls also were recently reported. Thirty-four rubber manufacturing concerns with 12,602 workers earning $232,000 indicated a 1.2% drop in wage earners and a 14.4% drop in earnings from the previous month. The respective figures for 13,124 industrial groups in the district, with 1,192,656 employes earning $30,567,000, represented decline of 2.8% and 3.6%. Of the 14 groups reporting the rubber industry showed by far the greatest decrease in earnings, but was eighth on the list showing decreased employment.

Output of automobiles and trucks is further declining. May production was estimated at 210,000 units, nearly 12% below April and 61% below May, 1937. Aggregate production for the first five months was more than 53% below the same period last year. June output was at less than the usual seasonal decline. The trade expects the number of cars produced during the third quarter to be below sales, and by the time the new model season opens, inventories will be on a workable level. The outlook for the industry for the remainder of the year is not promising.

Editor's Book Table

NEW PUBLICATIONS

"Neville Plasticizing Oils." The Neville Co., Pittsburgh, Pa. 8 pages. Four of the firm's plasticizing oils and solvents, Nevinol, No. 2 refined heavy oil, No. 1-D heavy oil, and P. H. O., are discussed in this booklet. The physical and chemical properties, applications, and other characteristics of each oil are covered in detail. Nevinol can be used for: plasticizing certain rubber compounds; homogenizing emulsions of resin and latex; and plasticizing chlorinated rubber and Pliolite coating compositions. No. 2 refined heavy oil and No. 1-D heavy oil are suitable for the same application as Nevinol, provided that the stronger characteristic odor and darker color are permissible. P.H.O., a phenol-indene-coumarone reaction complex, is capable of acting as a mutual solubilizer for resins, oils, cellulose derivatives, etc., which would be incompatible otherwise. P.H.O. may also be used as a plasticizer for chlorinated rubber and as an ingredient of adhesives, artificial leathers, and electrical filling compounds.

"Stokes High Vacuum Pumps." F. J. Stokes Machine Co., Olney P.O., Philadelphia, Pa. 28 pages. This catalog contains illustrated descriptions of the firm's five sizes of high vacuum pumps which have capacities ranging from 10 cubic feet to 225 cubic feet. In addition the booklet discusses the applications, advantages, and economies of higher vacuum in industry and contains relevant data, charts, and tables.

"Directory of New England Manufacturers—1938-39." Published by Geo. D. Hall, Inc., 665 Boylston St., Boston, Mass., with the editorial cooperation of the New England Council. This directory is divided into four sections: (1) alphabetical section in which are listed 19,000 New England manufacturers together with their principal officers, products, number of employes, capital rating, and location of plants or branch offices; (2) geographic section in which the same concerns as above are classified by state, city, and town; (3) product section, alphabetically listing all products together with names and addresses of the manufacturers; and (4) brand name section in which brand, or trade, names of all New England products are listed, with the names of the manufacturers. Rubber manufacturers are listed under the various products containing rubber which they manufacture. The price is $15 before September 1, after this date, $20.

"Condor Whipcord Endless Belt." The Manhattan Rubber Mfg. Division of Raybestos-Manhattan, Inc., Passaic, N. J. 4 pages. This illustrated folder briefly describes the construction of the six styles of Condor Whipcord belts for endless drives in industrial and agricultural applications. The belting comprises an internal endless cord member, the cords of which are embedded in rubber, and a flexible outer covering of duck. The pulley side of the belt has an extra duck ply with a rubber friction surface. Instructions for determining proper belt length and a horsepower rating table for this type of belting are included.

"26 Interviews with Champion Farmers." The Firestone Tire & Rubber Co., Akron, O. 70 pages. This booklet combines under one cover reprints of 26 interviews with successful farmers on the Firestone Voice of the Farm radio program. The presentation of these stories is intended to furnish farmers with helpful information in increasing their yields and profits. The farm subjects covered by the interviews include: potatoes, corn, pigs, cattle, cotton, plowing, poultry, alfalfa, soy beans, lespedeza, apples, sheep, wheat, terracing, oats, grass silage, and strawberries.

"List of Publications of the Department of Commerce." United States Department of Commerce, Washington, D. C. 147 pages. This booklet, issued annually and revised up to July 1, 1938, contains a complete list of the available publications of the Department of Commerce. Included in this listing are the publications of the following department branches: Bureau of the Census, Bureau of Foreign and Domestic Commerce, National Bureau of Standards, Bureau of Air Commerce, and Bureau of Marine Inspection and Navigation. Copies of this booklet may be obtained upon request from the Superintendent of Documents, Government Printing Office, Washington, D. C.

"Better Buymanship. No. 17—Automobile Tires." Household Finance Corp., 919 North Michigan Ave., Chicago, Ill. 20 pages. One of a series to aid consumers, this booklet points out the various considerations in selecting a tire for: riding comfort, quiet operation, easy steering, safety, and greatest mileage per dollar cost. Also discussed are the factors involving the care of tires and the method of automobile handling, which directly influence tire cost per mile of driving. Inner tubes and retreading are covered in separate sections.

(*Continued on page 78*)

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(*Continued on page 78*)

Rubber Industry in Europe

GREAT BRITAIN

Further Research Wanted

Two resolutions calling for further research were put forward at two different sessions of the International Rubber Technology Conference in London and were carried unanimously. The first was moved by Professor de Vries (Holland) and seconded by Lieut. Col. B. J. Eaton (vice-chairman of the Conference Committee) and was as follows:

"This session of the conference desires to urge the importance of the suggestions put forward in the paper (No. 1) by Prof. E. de Wildeman, and referred to also by Lieut.-Colonel Eaton (paper 93). The session is of opinion that fundamental research on the formation of a physiology of latices (including those from plants other than *Hevea brasiliensis*) containing caoutchouc, gutta percha or allied hydrocarbons, is very desirable, and draws the attention to this point of research of the organizations in the rubber growing countries, also with regard to undertaking such work in collaboration with organizations and scientists in Europe and America. Emphasis is laid on the desirability of knowing the exact source and any previous treatment of the material under examination, and the desirability of taking steps to retain suitable areas of such other types of latice-producing plants already in existence."

The second resolution, which was put forward to the Latex Session, proposed by Professor de Vries and seconded by Dr. D. F. Twiss (Great Britain), was as follows:

"Whereas increased fundamental knowledge concerning the factors affecting stability and electrostatics of latex and the structure of the rubber particle and coagulation is of the utmost importance, it is, therefore, very desirable that more profound study be made of the simple forms of latex, such as washed cream, washed centrifugate, sterile latex and others. Producers and their research organizations are, therefore, invited to make available in an easy and simple way sufficient quantities of such products for those investigators who wish to have them for their research work."

Alloprene

The Synthetic Resin Section of the Teddington Chemical Research Laboratory has been doing some notable research work on chlorinated rubber. In his address to the Institute of the Plastics Industry, Sir Gilbert Morgan mentioned the results obtained with Alloprene, the I.C.I. product, details of which are quoted by Dr. Schidrowitz in a recent issue of *India Rubber Journal.*

Alloprene has valuable electrical properties—power factor 0.003, dielectric constant 3.0 to 3.4, and breakdown voltage 2,500 volts/mil. When it is molded with various fillers, dense hard products of considerable strength are obtained over a range of temperatures from 100 to 150° C.

Layers of cloth impregnated with Alloprene and molded yield composite products varying in density and structure from those of hard boards that can be cut or sawed, to an expanded, vesicular structure similar to expanded chlorinated rubber, depending upon the rate of pressure release. These moldings appear to be good insulators of heat, sound, and electricity and are not affected by prolonged immersion in water.

Transparent, almost colorless sheets are obtained if Alloprene is dissolved in a suitable solvent, and the latter is evaporated. The material has the advantage of uniting with basic coloring matter in a remarkable manner. Thus when the carbinol base of rosaniline or brilliant green is dissolved in the benzene solution, the color of the basic dye is rapidly developed by the plastic. When the solvent is removed, a colored sheet is obtaind from which the dye is not readily extracted by water, dilute acids, or alkalis.

According to Sir Gilbert, the most striking property of Alloprene is that it can be used as a plastic without the addition of any filler. Moldings made under a pressure of one ton per square foot at 115 to 120° C. are opaque if the pressure is released immediately at the high temperature. But if the pressure is retained while the mold is cooled to approximately 70° C., then a completely transparent molding is obtained, the color of which will depend on the nature of the rubber before chlorination. Thus when the basic material is deproteinized rubber, transparent, almost colorless moldings result. Sir Gilbert suggests further study may place this plastic product within the category of colorless glasses.

SWEDEN

Since the abolition of the tire tax in Sweden, effective May 9, 1938, domestic tire prices have undergone considerable reduction, in most cases almost 50%. The price of imported tires has not yet been changed, but these tires have always been 10 to 12% higher in price than those made in Sweden, and it is thought that this differential will be maintained.

FRANCE

Radio-coagulation of Latex

About three years ago Henri Leduc first described his method of homogeneous vulcanization by high-frequency electric current—a method now known as radio vulcanization.[1] According to a recent issue of *Le Caoutchouc et La Guttapercha,* he has now worked out a method of radio-coagulation for latex by submitting it to the action of a high frequency electric field (10,000,000 to 20,000,000 periods second). By this means, he claims, the latex is instantly and uniformly heated throughout its entire mass so that a perfectly homogeneous coagulation is obtained. By this method can be made latex thread, tubes, hospital sheets, carpets, belting, covered thread, sponge rubber goods, and the like.

Another problem that M. Leduc appears to have successfully dealt with is that of overcoming the tendency of latex baths, especially in the manufacture of dipped goods, to form skins on the surface and to retain air bubbles.

In an article,[2] which received the 1937 award of the Syndicat du Caoutchouc, he describes his method of treatment, by which latex mixed with sulphur, fillers, accelerator, and zinc oxide, can be kept in open containers for long periods of time without formation of surface skin. This method consists in adding a casein solution to the fillers which have been mixed to a paste with hot water first; then castor oil, oleic acid, and paraffin are incorporated, and lastly the concentrated, ammoniated latex. Instead of the oil mixture, a suitable colloid product may be used, or a solution of boric acid or other weak or suitably diluted acid.

M. Leduc says that he has been able to keep latex so treated in uncovered containers for as long as six months without a skin forming on top.

[1] India Rubber World, Feb. 1, 1936, p. 44.
[2] *Rev. gén. caoutchouc,* May, 1938, pp. 127-28.

French Rubber Exports

Thanks to increased shipments to her colonies, France's exports of rubber goods in 1937 advanced in quantity and value as compared with 1936 despite the fact that a sharp decline occurred in exports to different foreign countries. The greater part of the exports consisted of tires and tubes for automobiles and totaled 80,075, against 77,261 quintals; cycle tires and tubes were 13,198 quintals, against 12,472 quintals; footwear 4,746 quintals, against 3,218 quintals; sanitary goods fell from 231 to 161 quintals; other rubber goods exported to foreign countries dropped

from 7,952 to 5,939 quintals, but those shipped to French colonies rose from 7,952 to 10,826 quintals.

Altogether, about 60% of the exports went to French colonies in 1937; they increased 5.7% in quantity and 38.6% in value as compared with 1936; on the other hand though the value of exports to foreign countries actually increased 46.6%, the quantity declined 2.2%.

GERMANY

Imports and Exports

German crude rubber imports again dropped sharply in April to 66,080 quintals against 88,044 quintals in April, 1937; the total for the first four months of 1938 was 310,697 quintals, against 318,487 quintals for the same period of 1937. In May, however, occurred a renewed spurt in imports, when arrivals of crude totaled 97,885 quintals.

Exports of manufactured goods have been falling off. April, 1938, showed a particularly heavy decline to 13,368 quintals, value 3,501,000 marks, against 19,227 quintals, value 4,387,000 marks, in April, 1937. The totals for the first four months of 1938 were 54,230 quintals, value 14,112,000 marks, against 63,368 quintals, value 14,637,000 marks, for the first four months of 1937.

Buna for Cable Insulation

Experiments have been made with different types of Buna for cable insulations and protective coverings for cables.[1] In general it has been found that the insulation value of Buna S and the numerical Bunas approaches that of natural rubber. In some respects Bunas have even proved superior to natural rubber, for instance where the insulation is exposed to high temperatures for prolonged periods, where conductors are laid in moist places and under conditions where good abrasion resistance is required. Buna S and Perbunan show smaller permanent deformation than natural rubber and are more resistant to oil and benzene. Pure Buna S absorbs 35% less water than natural rubber, when used for marine cables, and is four times more resistant to ozone, a property which is important for X-ray cables and Neon conductors.

[1] H. Roelig, *ETZ*, 59, 172-174 (1938).

New Government Regulations

The government has fixed maximum prices for asbestos above which it is forbidden to sell.

As from July 1, 1938, the buying, selling, working, and storing of carbon and other blacks have been made subject to new regulations. After that date carbon blacks may not be bought without a special buyers' permit; consumers must obtain consumers' permits, and they may not use more than a certain fixed amount in a given period even if they have extra stocks on hand from which they could take the additional quantity. Consumers are to be notified every quarter as to the percentage of blacks they may use.

The Strength through Joy Automobile

A few months ago it was stated[2] that at the International Automobile Show, Berlin, a model was shown of a factory where the best and cheapest automobile in the world is to be built. It now develops that this is the factory at Fallersleben, the foundation stone of which was laid by Hitler in June; while the car in question is the popular-priced car to be known as the "Kraft durch Freude," or the "Strength through Joy." The car is to be made as far as possible from German-produced synthetic materials. Tires and presumably other rubber parts are to be of Buna; artificial silk is to take the place of cotton for the cord in the tires; imitation leather will go into the upholstery; while the body is to be of some cheap plastic. The cars are to cost the equivalent of $400, which can be paid in easy instalments; they will be cheap to run as they are reported to use only 1½ gallons of fuel and 1/10 liter of oil for every 60 miles; and they will have a speed of 60 miles per hour. It is expected to have the cars on the market by 1940.

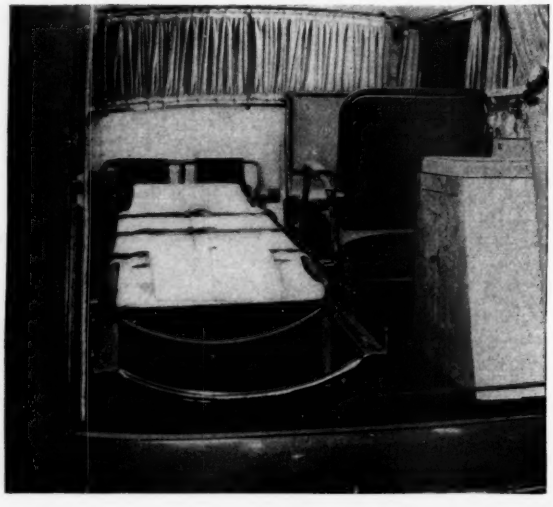
[2] India Rubber World, Apr. 1, 1938, p. 70.

New Toys

Among the novelties shown at the International Handicraft Exhibition, Berlin, were inflatable rubber animals covered with velvet, put out by the Hungarian Rubber Goods Factory.

Rubber in Dutch Ambulance

Characteristic of the Dutch reputation for thoroughness, comfort, and the *n*th degree of cleanliness, is the new "Ziekenauto," an innovation in ambulance service in Amsterdam, Holland. From the outside it looks like a regular deluxe sedan, with a somewhat extended wheel-base, but the inside presents the last word in ambulance equipment, for it is fully equipped with medical supplies and instruments to provide first aid while the patient is being transported. Besides the "Ziekenauto" has accommodations for two patients, a doctor, and a nurse.



Interior of "Ziekenauto"

Suspension of the patient is achieved by a unique arrangement of several hundred rubber cords, the angle of suspension of which can be altered to adjust the rebound, according to the condition of the road traveled. The car can be driven at speeds up to 100 kilometers without discomfort to the patient as it runs on low-pressure General Jumbo streamline tires said to take the road shocks off the chassis of the vehicle, which has, as another notable feature, an extremely low center of gravity.

The ambulance has steam heat and a wash basin with hot and cold running water. Washable leather constitutes all upholstery. Doors close noiselessly.

ITALY

About a year ago the Industrial Finance Society founded the Soc. Italiana per la Produzione della Gomma Sintetica. Now it has received permission to erect a factory in Bicocca, Milan, for the manufacture of synthetic rubber and is expected to produce 500 kilos daily.

The importation of a number of products, including spare parts for automotive vehicles and rubber gloves, has since July 1, 1938, been made subject to ministerial import license instead of quota.

"The durability of the nation's prosperity is dependent upon the prosperity of the nation's durable goods field. . . . The spending-lending program will not prevent a normal recovery. It may defer and restrict it. . . . Compared to the potential expenditures of private effort, the contemplated government spending-lending program dwarfs into insignificance." From "Golden Gates," address by H. H. Heimann, executive manager, National Association of Credit Men, forty-third Annual Credit Congress, San Francisco, Calif., June 6.

Rubber Industry in Far East

INDO-CHINA

Rubber Plantation Industry

Rubber growing appears to have had little attraction for French investors in the early years of the industry, and it was not until 1906 that a definite beginning was made when the Susannah estate was started. From then on until 1925, says W. G. Birnie,[1] almost 85,000 acres were planted. But the real spurt came during 1926-1932, and today the total planted area is about 315,000 acres, of which over one-third is budgrafted.

While there are many small European estates besides several very large ones, native rubber is practically nonexistent here. The main feature of the climate in Indo-China is the prolonged dry season during which little or no rain falls. This might seem a disadvantage for rubber growing; yet Mr. Birnie assures that it really offers no handicap, but, on the contrary, is chiefly responsible for the absence of root-disease in the country. The rubber grows very well, and good yields are obtained. Hundreds of young areas budded in 1930 and 1931 yielded over 600 pounds an acre when tapped on a commercial scale in 1937; some old ungrafted rubber on red soil also averages over 600 pounds an acre.

The progress of rubber production in Indo-China is illustrated by the following table; for comparative purposes the total consumption of rubber in France is also given:

Year	Production Tons	Consumption in France Tons
1926.....	8,100	35,700
1927.....	8,900	35,700
1928.....	9,100	38,000
1929.....	9,500	61,800
1930.....	9,700	71,400
1931.....	11,000	47,800
1932.....	13,500	41,700
1933.....	17,300	63,100
1934.....	19,600	50,400
1935.....	28,700	52,300
1936.....	40,800	56,828
1937.....	43,374	59,959

Because areas were planted in recent years, most estates have very modern factories, and because the water supply is likely to be a problem, manufacture must be centralized, and the factory units are very large. Many estates have sheeting batteries, locally made, which regularly turn out 4,500 pounds an hour, and have had them for considerable time; whereas in Malaya up-to-date sheeting batteries have an output of 1,500 to 3,000 pounds an hour. Indeed Indo-China has the largest sheeting factory in the world, that of the Compagnie du Cambodge, which is capable of dealing with 90,000 pounds of dry sheet daily.

[1] "The Rubber Plantation Industry in French Indo-China." *Bull. Rubber Growers' Assocn.*, June, 1938, pp. 239-49.

Research Institute

The Syndicat des Planteurs de Caoutchouc de l'Indochine is considering establishing a rubber research institute in Indo-China, similar to the research organizations in Malaya, Ceylon, and Netherland India. Indo-China, it is felt, has become increasingly important as a rubber producer and needs its own organization, particularly to deal with purely local problems of soil and climate, classification of proved clones, the special quality of locally produced latex, etc. If such an institute is formed, it will collaborate with the Institut Français du Caoutchouc. It is proposed to provide funds by means of a tax on exported rubber.

JAPAN

The Ministry of Commerce, Japan, has promulgated an order providing for the establishment of a supply and demand readjustment council for cotton and woolen goods, and a similar organization for rubber is likely.

Rubber manufacturers are reported to be in a very difficult position because of the restrictions on rubber and cotton. At the same time the import restrictions and rising prices are causing consumers to buy heavily.

Two or three rubber goods factories in Osaka, in addition to one in Kobe and Kurume in Kyushu, as well as others in Tokyo, are said to have been designated to manufacture war supplies for the nation.

Synthetic rubber has been successfully produced and is to be manufactured on an industrial scale by the Osaka Industrial Experiment Station of the Commerce Office, it is reported from Osaka.

According to other press reports, the Tokyo Spinning Co. is preparing to establish the Toyo Tire Industry Co. in Mukden, Manchuria. It seems to be the plan to erect a factory there with one-half the proposed capital of 10,000,000 yen with a view to producing tires in Manchuria and North China.

The Toyo Spinning Co., also known as the Toyo Boseki Kabushiki Kaisha and the Toyo Cotton Mills Co., Ltd., has a paid-up capital of 72,725,000 yen and reserves said to total 64,280,000 yen.

MALAYA

Reduced Quota Benefits

Taken as a whole, local rubber producers and others interested in the rubber industry welcomed the decision of the International Rubber Regulation Committee to cut the quota for the third quarter to 45%. This action is considered the most courageous that the committee ever made, and the decision is regarded as a determined effort of the committee to force the price to considerably higher levels. Prices will certainly have to be very much higher than they have been for some time now to compensate for the cut and to allow the average estate to make a profit. Malaya will be allowed to export only about 22,500 tons monthly, against 30,100 monthly for the second quarter.

But there is help for the producers in the new ruling by which they are to be permitted to increase the stocks of rubber they may hold. At present estates may hold stocks equivalent to two months' export allowance; this has been altered to allow them to hold the equivalent of up to 25% of the 1937 assessments. This change will ease the labor problem which would have been a very delicate one for most estates otherwise, especially for those who employ Tamils, many of whom would have had to be repatriated. And it can be imagined what difficulties would have been caused when the quota was once again appreciably raised.

Are Costs Too High?

In his speech at the meeting of the United Sua Betong Rubber Estates, Ltd., J. G. Hay said Malaya had lost ground in the endeavor to reduce costs of rubber production in recent years and that the costs question demanded close inquiry by the industry's associations and governments. Mr. Hay is a member of the International Rubber Regulation Committee and recently made an extensive tour of estates in Malaya and Netherland India with the object, among others, of seeing how costs could be reduced.

Rubber Manufacture

The principal rubber goods manufacturers in the Federated Malay States, reported recently by *Times of Malaya*, are the Shum Yip Leong Rubber Works, the Malayan Rubber Works, and the Bata Shoe Co., all in Klang, where Bata opened in May, 1937.

The goods manufactured and ex-

ported include bicycle tires and tubes, clog straps in the sheet, rubber-soled and rubber-sided footwear, rubber bushes, liners, buffers, packing, and hose. Much retreading is done in the country, and rubber for retreading is turned out in comparatively large amounts. Sheets of rubber with fabric inserted are used chiefly for making straps in different colors for clogs and similar footwear for Asiatics. They are made by hydraulic presses at the rate of 600 sheets daily. Large quantities of footwear are produced and exported to practically all the dominions and colonies; there is also a market for them in Manilla. At present the first two companies produced footwear primarily for the Malayan trade, but they are said to be preparing to expand and before long are expected to be able to compete in the world market with any country.

Labor employed by these works is practically all Chinese. Shum Yip Leong has 415 workers; during the past year it started the manufacture of lined, corrugated, and armored suction hose for the first time; these proved so successful that the works have now a contract to supply the F.M.S. Railways as and when required. The Malayan Rubber Works employs 384 persons; it is experimenting with the manufacture of gas masks, but so far has not met with much success. Bata employs 110 persons.

The three firms together use about 91,750 pounds of rubber monthly in addition to 127 tons of chemicals and fillers and 72,160 yards of British produced cloth.

NETHERLAND INDIA

TREND OF RUBBER EXPORTS, BY TYPES, IN METRIC TONS DRY WEIGHT

	1933	1934	1935	1936	1937
Latex	5,345*	5,415	7,664	10,856	13,870
Sprayed rubber	11,135	10,769	3,418	1,934	1,802
Dry rubber	154,762	183,421	131,426	150,410	214,354
Total estate rubber	171,242	199,605	142,508†	163,200‡	230,026
Native rubber	115,576	185,887	144,892	151,398	208,551
Total exports	286,818	385,492	287,400†	314,598‡	438,577

*Dry equivalents of exports of 14,981 tons wet weight.
†Exclusive 70 tons of rubber articles.
‡Exclusive 257 tons of rubber articles.

Protest on Export Duty

The General Agricultural Syndicate, the recognized association of estate owners in Java, intends to petition the government to reduce the present export duties on rubber. Rubber export duties now amount to 3.23 guilder cents per half kilo, of which 2.9 cents is regular export duty and 0.33 cents the new "defense export duty." The former duty was fixed for a period of high rubber prices, and the prevailing low prices do not warrant it.

In the Volksraad the unfavorable position of the rubber industry was stressed, and at the same time it was pointed out that finances of the public exchequer have improved since 1935 when the duty was imposed and that, furthermore, the export duty is not applied to any other product but rubber. The government's budgetary position, however, is not so favorable as might be supposed; in fact latest reports indicate that there will be a general upward revision of taxes and import duties in 1939.

Less Sprayed Rubber, More Latex

In recent years there has been a steady decline in exports of sprayed rubber and a corresponding increase in latex exports. This trend is illustrated in the above table in which the total exports and the types of rubber are given for each of the years 1933 to 1937, inclusive.

Rubber Planting in New Guinea

As recently reported,[1] plans were being considered to establish a Government Rubber Plantation in New Guinea. It is now learned that the government has approved certain plans and that the cultivation of rubber on an experimental scale will be definitely started in the second half of this year.

[1] INDIA RUBBER WORLD, May 1, 1938, p. 71.

Export Data

Final export figures for April, 1938, issued by the Central Bureau of Statistics, follow: Java and Madura, 6,062 tons; Outer Provinces, estate rubber, 11,067 tons, and native rubber, 11,808 tons. In addition Java exported 48 tons of rubber in the form of tires, bringing the total for the month to 28,985 tons.

The decreased outputs from estates are reflected by the sharp increase in the untapped area in the early months of 1938. In February the total untapped area had been 119,549 hectares, but by March there was a sharp rise to 136,576 hectares, which was over 25% of the total tappable area.

FINANCIAL[1]

Unless otherwise stated, the results of operations of the following companies are after deductions for operating expenses, normal federal income taxes, depreciation, and other charges, but before provision for federal surtax on undistributed earnings. Most of the figures are subject to final adjustments.

Dayton Rubber Mfg. Co., Dayton, O. Seven months ended May 31: net profit, after all charges including federal income tax, but before undistributed profits tax, $189,039, equivalent after preferred dividend requirements to 76¢ a share on 176,839 shares of capital stock outstanding. Net sales for the seven-month period were 20% below those for the same period of 1937, but 10% above the like period of 1936, according to President A. L. Freedlander. Inventories are approximately 27% less than at this time last year.

The company's production schedules for June increased over those of May, and the schedules planned for July represented an increase over June.

[1] Dividends Declared on p. 78.

E. I. du Pont de Nemours & Co., Inc., Wilmington, Del. First half of 1938: earned $1.36 a share on the common stock, against $3.41 a share in the corresponding six months of 1937. For the quarter ended with June, the earnings, based on a comparison of the company's reports for the first quarter of the fiscal year and the six months period, were equal to 71¢ a common share. This compared with 65¢ a share in the first quarter of 1938 and with $2.07 a share in the second quarter of 1937.

The General Tire & Rubber Co., Akron, O., and subsidiaries. Six months ended May 31: net profit, after all charges and provision for normal federal income tax, $108,153.24, compared with $991,262.21 for the same period ended May 31, 1937.

Hewitt Rubber Corp., Buffalo, N. Y. Six months ended June 30: net profit, $21,787, equal to 13¢ a share on the 168,188 common shares, against $200,017, or $1.19 a share, in the first half of 1937.

LIBERIA

Rubber production in Liberia, progressing fairly rapidly during the past four years, advanced sharply during the first quarter of 1938, when output was 141% higher than for the same period of 1937; while United States imports rose from 1,000,966 pounds, including 652,017 pounds of latex, to 2,415,012 pounds, including 1,242,700 pounds of latex. In recent years the United States imported the following amounts of rubber from Liberia: 1934, 63 long tons; 1935, 815 long tons; 1936, 1,582; and 1937, 2,028 long tons.

Patents and Trade Marks

MACHINERY

United States

2,120,282. **Mold for Presses.** H. B. Klippel and C. H. Sorrick, Jr., both of Akron, O., assignors to American Hard Rubber Co., New York, N. Y.

2,120,558. **Apparatus to Loosen Articles from Molds.** R. D. Hulslander, assignor to Firestone Tire & Rubber Co., both of Akron, O.

2,120,700. **Vulcanizing Mold.** A. W. Gay, assignors to Rapid Mold Co., both of Akron, O.

2,120,721. **Rubber Thread Apparatus.** A. N. Spanel, Rochester, N. Y.

2,120,758. **Elastic Knitted Fabric Apparatus.** H. K. Lea, assignor to Kenlea Mfg. Corp., both of Johnstown, N. Y.

2,120,062. **Thread Cutter.** E. Vincke, Palamos, Spain, assignor to H. H. Straus, New York, N. Y.

2,121,252. **Retreader.** F. W. Marco, Albany, assignor, by mesne assignments, to Kite Mold Co., Los Angeles, both of Calif.

2,121,635. **Apparatus to Form Condensed Carbon Black.** W. A. Knapp and W. W. Gregory, both of Monroe, La., assignors to Imperial Oil & Gas Products Co., Pittsburgh, Pa.

2,121,957. **Apparatus to Secure Valve Stems to Tubes.** J. A. Fleischli and J. M. Kountzman, assignors to Cupples Co., all of St. Louis, Mo.

2,122,726. **Elastic Thread Apparatus.** T. L. Shepherd, London, England.

2,123,174. **Elastic Yarn Feeding and Tensioning Mechanism.** G. W. Lindley, Philadelphia, Pa.

2,123,377. **Apparatus for Cutting, Embossing, and Adhering Labels.** G. Papp, Maspeth, N. Y., and W. Meyer, Princeton, N. J., assignors to Peters Bros. Rubber Co., Inc., Brooklyn, N. Y.

2,123,586. **Tire Building Apparatus.** A. L. Heston, assignor to National Rubber Machinery Co., both of Akron, O.

Dominion of Canada

374,447. **Vulcanizing Clamp.** Van Cleef Bros., (a partnership consisting of N., F., and P. Van Cleef), assignee of Van Cleef Bros., (a partnership consisting of N., F., M., and P. Van Cleef), assignee of A. H. Breslove, all of Chicago, Ill., U. S. A.

374,554. **Tire Mold Forming Apparatus.** Dominion Rubber Co., Ltd., Montreal, P. Q., assignee of J. W. Bishop, Detroit, and A. W. Bull, Grosse Pointe, co-inventors, both in Mich., U. S. A.

374,564. **Splicing Machine.** General Tire & Rubber Co., assignee of M. L. Engler and W. J. Bretch, co-inventors, all of Akron, O., U. S. A.

374,616. **Sheathed Article Producing Apparatus.** C. F. Moody, Yonkers, and E. A. Mitchell, Hastings-on-the-Hudson, co-inventors, both in N. Y., U. S. A.

374,712. **Vulcanizing Unit.** Dill Mfg. Co. of Canada, Ltd., Toronto, Ont., assignee of J. C. Crowley, Cleveland Heights, O., U. S. A.

374,713. **Vulcanizing Unit.** Dill Mfg. Co. of Canada, Ltd., Toronto, Ont., assignee of H. A. Van Dyke, Grove City, O., U. S. A.

United Kingdom

480,131. **Overshoe Mold.** H. Malm.

480,134. **Treating Fabric Apparatus.** Wingfoot Corp.

480,294. **Vulcanizer.** A. Pickwell.

480,508. **Extruder.** Soc. Italiana Pirelli.

481,140. **Valve Pressing Device.** General Tire & Rubber Co.

PROCESS

United States

20,777. **(Reissue.) Synthetic Rubber.** W. S. Calcott, Woodstown, F. B. Downing, Carneys Point, and D. H. Powers, Moorestown, all in N. J., assignors to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

2,120,281. **Permeable Body.** K. E. Hunt, Paquannock, N. J., assignor to American Hard Rubber Co., New York, N. Y.

2,120,346. **Inner Tubes.** G. W. Becker, Silver Lake, assignor, by mesne assignments, to Dill Mfg. Co., Cleveland, both in O.

2,120,392. **Chlorination of Ketones.** A. E. Calkins, Akron, O., assignor to B. F. Goodrich Co., New York, N. Y.

2,120,406. **Glove.** M. E. Hansen, assignor to American Anode, Inc., both of Akron, O.

2,120,458. **Waterproof Seam.** J. P. Bodle, assignor to Mishawaka Rubber & Woolen Mfg. Co., both of Mishawaka, Ind.

2,120,461. **Protecting and Forming Prefinished Metal.** L. G. Copeman, assignor to Copeman Laboratories Co., both of Flint, Mich.

2,120,540 and 2,120,541. **Carbon Black.** E. Billings, Weston, and H. H. Offutt, Winchester, assignors to G. L. Cabot, Inc., Boston, all in Mass.

2,120,572. **Rapid Coagulation of Rubber.** M. M. Riatel, Turin, Italy, assignor to Cela Holding S. A., Paris, France.

2,120,720. **Sheet Latex Articles.** A. N. Spanel, Rochester, N. Y.

2,120,722. **Coating Canvas Gloves.** N. E. Tillotson, Watertown, Mass.

2,121,018. **Ceramic Articles.** M. Carter and G. Heinz, both of Trenton, N. J.: said Carter assignor to E. B. Carter, Morrisville, Pa.

2,121,036. **Plugging Porous Strata in Wells.** C. Irons, assignor to Dow Chemical Co., both of Midland, Mich.

2,121,633. **Treating Carbon Black.** J. Hartman, Pittsburgh, Pa., and W. A. Knapp, Monroe, La., assignors to Imperial Oil & Gas Products Co., Pittsburgh, Pa.

2,121,709. **Leather-like Material.** J. J. Moriarty, Toronto, Ont., Canada, assignor to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

2,121,717. **Coating Fabrics.** D. J. Sullivan, Fairfield, Conn., assignor to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

2,121,721. **Articles from Latex.** H. L. Welker, Williamsport, Pa.

2,121,872. **Battery Plate Separators.** E. Hazell, New York, N. Y., and A. W. Keen, Passaic, N. J., assignors to United States Rubber Products, Inc., New York, N. Y.

2,122,232. **Centrifugal Concentration of Latex.** J. B. Crockett, Malden, assignor to Heveatex Corp., Melrose, both in Mass.

2,122,240. **Mat.** W. G. L. Smith, Los Angeles, Calif.

2,122,335. **Hose.** M. Berman and W. Brockner, assignors to Hewitt Rubber Corp., all of Buffalo, N. Y.

2,122,438. **Expanded Rubber.** D. Roberts, New York, N. Y., and T. A. Scott and F. W. Peel, both of Baltimore, Md., assignors to Rubatex Products, Inc., a corporation of Del.

2,122,727 and 2,122,728. **Rubber Process.** T. L. Shepherd, London, England.

2,123,482. **Rubber Mixtures.** J. R. de Jong, Amsterdam, Netherlands, assignor to Shell Development Co., San Francisco, Calif.

2,123,855. **Treating Rubber Composition.** H. F. Palmer, Akron, O., and G. W. Miller, Los Angeles, Calif., assignors to Xylos Rubber Co., Akron, O.

2,123,862. **Treating Latex.** W. T. L. Ten Broeck, Dolok Merangir, East Coast Sumatra, assignor to Wingfoot Corp., Wilmington, Del.

Dominion of Canada

374,444. **Shoe Manufacture.** United Shoe Machinery Co. of Canada, Ltd., Montreal, P. Q., assignee of C. D. Merritt, Rutherford, N. J., U. S. A.

374,488. **Spongy Rubber Product.** J. A. Talalay, Bedford, England.

374,571. **Rubber Article Manufacture.** International Latex Processes, Ltd., St. Peter's Port, Channel Islands, assignee of J. F. Schott, Mishawaka, Ind., U. S. A.

374,829. **Extensible Thread Manufacture.** American Anode, Inc., Akron, assignee of C. L. Beal, Cuyahoga Falls, both in O., U. S. A.

374,847. **Adhesive Backing.** Canadian Industries, Ltd., Montreal, P. Q., assignee of E. H. Nollau, Wilmington, Del., and D. A. Rankin, White Plains, N. Y., co-inventors, both in the U. S. A.

374,868 and 374,869. **Sponge Rubber.** International Latex Processes, Ltd., St. Peter's Port, Channel Islands, assignee of S. R. Ogilby, Staten Island, N. Y., U. S. A.

United Kingdom

480,204. **Preventing Cracking of Rubber Articles.** Consolidated Rubber Manufacturers, Ltd., (G. G. Havens).

480,627. **Removing Molds from Cast-**

ings. H. Kappeler, R. Mangold, and K. Noll.
481,079. **Bonding Artificial Silk to Rubber.** R. F. McKay, (International Latex Processes, Ltd.).
481,219. **Balls.** F. T. Roberts.
481,234. **Cushioning Material.** S. Shimizu.
481,427. **Coating Webs.** A. F. Burgess, (Marathon Paper Mills Co.).
481,589. **Rubber Threads.** R. and J. Pickles.
482,016. **Printing Surfaces.** E. Gundlach A.G.
482,085. **Glass Fibers.** Naamlooze Vennootschap Maatschappij Tot Beheer En Exploitatie Van Octrooien.
482,119. **Elastic Smocking.** S. F. Warren, (Goldberger Sàm. F. ès Fiai R. T.).
482,844. **Spraying Fabrics with Liquids.** F. F. Schwartz and M. A. Chavannes.

Germany

661,248. **Rubber Thread.** International Latex Processes, Ltd., St. Peter's Port, Channel Islands. Represented by C. and E. Wiegand, both of Berlin.
662,220. **Bathing Caps.** O. Moser, Vienna. Represented by W. Meissner and H. Tischer, both of Berlin.

CHEMICAL

United States

2,120,547. **Vulcanizing Agent.** A. M. Clifford, Stow, O., assignor to Wingfoot Corp., Wilmington, Del.
2,121,087. **Cement-Latex Composition.** J. Labra, Long Island City, N. Y.
2,121,618 and 2,121,619. **Antioxidant.** I. Williams, Woodstown, N. J. and A. M. Neal, assignors to E. I. du Pont de Nemours & Co., Inc., both of Wilmington, Del.
2,122,118. **Joint Composition.** E. Studt, assignor to Norddeutsche Seekabelwerke Aktiengesellschaft, both of Nordenham, Oldenburg, Germany.
2,123,370, 2,123,371, 2,123,372, and 2,123,373. **Ammonium Dithiocarbamate.** R. A. Mathes, Akron, O., assignor to B. F. Goodrich Co., New York, N. Y.
2,123,605. **Synthetic Resin.** J. H. Kelly, Jr., Chicago, Ill.
2,123,841. **Mercapto Aryl Thiazoles.** A. M. Clifford, Stow, O., assignor to Wingfoot Corp., Wilmington, Del.
2,123,844 and 2,123,845. **Accelerators.** H. I. Cramer, Cuyahoga Falls, O., assignor to Wingfoot Corp., Wilmington, Del.

Dominion of Canada

374,884. **Hydrohalogenated Butadiene Derivative and Hydrochlorinated Rubber.** Marbon Corp., Chicago, Ill., U. S. A., assignee of M. Gebauer-Fuelnegg, Vienna, Austria, administratrix of the estate of E. Gebauer-Fuelnegg, deceased, in his lifetime of Vienna, and E. W. Moffett, Chicago, co-inventor with the said E. Gebauer-Fuelnegg, deceased.
374,916. **Mercapto Aryl Thiazole.** Wingfoot Corp., Wilmington, Del., assignee of H. P. Roberts, Akron, O.
374,917. **Vulcanizing Agents.** Wingfoot Corp., Wilmington, Del., assignee of J. G. Lichty, Stow, O.

United Kingdom

480,178. **Plasticizers.** E. I. du Pont de Nemours & Co., Inc.
480,492. **Adhesives for Cellulosic Fibers in Tires.** Wingfoot Corp.
480,793. **Latex-Cement Compositions.** A. G. Rodwell and S. H. Colton.
480,862. **Puncture-Sealing Composition.** E. S. Rowlandson.
480,881. **Fibrous Composition.** F. G. Denton.
481,034. **Gutta - Percha - Resin Lining Compositions.** W. J. Tennant, (Crown Cork & Seal Co.).
481,182. **Insulation Compositions.** British Thomson-Houston Co., Ltd.
481,426. **Thermoplastic Film-Forming Composition.** A. F. Burgess (Marathon Paper Mills Co.).
481,465. **Substituted Arylene Diamines.** United States Rubber Products, Inc.
481,960. **Rubber Substitutes.** A. H. Stevens (Harvel Corp.).
482,122. **Halogenated Rubber Adhesive.** B. F. Goodrich Co.
482,225. **Adhesives for Gummed Tape.** Creed & Co., Ltd.

GENERAL

United States

20,785. (Reissue). **Garment.** E. D. Kattermann, assignor to Swiss Knitting Co., both of Dover, N. J.
2,120,277. **Rubber Covered Impeller.** G. A. H. Grierson, assignor to Canadian Allis-Chalmers, Ltd., both of Toronto, Ont., Canada.
2,120,379. **Inner Tube.** R. S. Taylor, P. M. Torrance, and R. H. Anderson, assignors to Firestone Tire & Rubber Co., all of Akron, O.
2,120,393. **Printing Ink.** R. A. Crawford, Akron, O., assignor to B. F. Goodrich Co., New York, N. Y.
2,120,434. **Vehicle Topping.** E. C. Clayton, assignor to W. E. Hooper & Sons Co., both of Baltimore, Md.
2,120,445. **Form to Depict Appearance of Shoe Upper.** J. R. Sutton, New York, assignor to I. Miller & Sons, Inc., Long Island City, both in N. Y.
2,120,478. **Electroplating Apparatus.** P. L. Amundsen, Detroit, Mich.
2,120,508. **Corset.** G. Rayner, Vancouver, B. C., Canada.
2,120,567. **Golf Ball Cover.** J. A. Merrill. Akron, O., assignor to Wingfoot Corp., Wilmington, Del.
2,120,665. **Elastic Fabric.** N. A. Crimmins, Stoughton, Mass., assignor, by mesne assignments, to United States Rubber Products, Inc., New York, N. Y.
2,120,698. **Belt Connecter.** A. L. Freedlander and N. J. Ritzert, assignors to Dayton Rubber Mfg. Co., all of Dayton, O.
2,120,713. **Leg Straightening Attachment.** A. and E. Rottke, both of Wiesbaden, Germany.
2,120,738. **Rubber Coated Article.** E. C. Domm, assignor to National-Standard Co., both of Niles, Mich.
2,120,817. **Foundation Garment.** M. Simon, assignor to I. B. Kleinert Rubber Co., both of New York, N. Y.
2,120,948. **Atomizer.** C W. Beck, Toledo, O.
2,121,052. **Pontoon.** D. Roberts, New York, N. Y., and F. W. Peel, London, England, assignors to Rubatex Products, Inc., Wilmington, Del.
2,121,125. **Belt and Belt Connecter.** A. L. Freedlander, assignor to Dayton Mfg. Co., Both of Dayton, O.
2,121,139. **Pickling Tank Structure.** J. A. Clauss, Detroit, and D. E. McGuire, Wyandotte, assignors to Great Lakes Steel Corp., Ecorse, all in Mich.
2,121,222. **Belt.** A. L. Freedlander, assignor to Dayton Rubber Mfg. Co., both of Dayton, O.
2,121,300. **Atomizing Apparatus.** L. Peycru, Paris, France.
2,121,353. **Heel.** H. R. Hustad, New York, N. Y.
2,121,384. **Composite Sponge.** H. Z. Gray, Lebanon, O.
2,121,650. **Belt.** M. Berman and T. C. Zinter, assignor to Hewitt Rubber Corp., all of Buffalo, N. Y.
2,121,678. **Footwear Material.** H. F. Armor, Fairfield, Conn., assignor to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.
2,121,702. **Baseball Head Protector.** E. Larkin, Washington, D. C.
2,121,740. **Skid-Preventing Device.** H. T. Kraft, assignor to General Tire & Rubber Co., both of Akron, O.
2,121,741. **Hose Nozzle.** A. C. Lusher and D. L. Spender, assignors to Scovill Mfg. Co., all of Waterbury, Conn.
2,121,746. **Abrasive Wheel.** B. Sanford, assignor to Norton Co., both of Worcester, Mass.
2,121,747. **Hose Nozzle.** A. J. Scholtes, Biloxi, Miss., assignor to Scovill Mfg. Co., Waterbury, Conn.
2,121,751. **Cutting-Off Wheel.** D. E. Webster, assignor to Norton Co., both of Worcester, Mass.
2,121,766. **Door Holder.** C. P. Wicks, assignor to Yale & Towne Mfg. Co., both of Stamford, Conn.
2,121,826. **Door Jamb.** D. Roberts, assignor to Rubatex Products, Inc., both of New York, N. Y.
2,121,827. **Stripping.** D. Roberts, assignor to Rubatex Products, Inc., both of New York, N. Y.
2,121,857. **Hosiery.** R. W. Carley, Wauwatosa, assignor to Phoenix Hosiery Co., Milwaukee, both in Wis.
2,121,871. **Tire Tread.** G. G. Havens, Detroit, Mich., assignor to United States Rubber Products, Inc., New York, N. Y.
2,121,955. **Tire Tread.** E. Eger, Grosse Pointe Park, Mich., assignor to United States Rubber Products, Inc., New York, N. Y.
2,121,956. **Nonskid Tire.** E. Eger, Grosse Pointe Park, Mich., assignor to United States Rubber Products, Inc., New York, N. Y.
2,121,963. **Steering Wheel Rim Cover.** K. E. Goit, Minneapolis, Minn.
2,122,006. **Dewooling Machine.** C. Jolly, Coogee, J. W. Archibald, Dulwich Hill, and H. J. Solomon, Sydney, all in Australia.
2,122,052. **Belt.** C. R. Bell, Rosharon, Tex.
2,122,064 and 2,122,065. **Wheel Balancing Unit.** J. W. Hume, Jackson, Mich.
2,122,090. **Brush.** O. C. Creighton, assignor to Kristee Mfg. Co., both of Akron, O.
2,122,126. **Hose End Structure.** H. Barnard, Houston, Tex., assignor to Whitehead Bros. Rubber Co., Trenton, N. J.
2,122,368. **Punch.** M. L. Engler, assignor to General Tire & Rubber Co., both of Akron, O.
2,122,399. **Ball and Pebble Mill.** P. O. Abbé, Bloomfield, assignor to P. O. Abbé, Inc., Little Falls, both in N. J.
2,122,461. **Goggles.** C. Fischer, New York, N. Y.

2,122,497. **Ventilating Insole.** G. E. Smith, Denver, Colo.
2,122,526. **Connection between Edges of Textile Material.** E. D. Kattermann, assignor to Swiss Knitting Co., both of Dover, N. J.
2,122,561. **Hat.** H. Dolan, Weehawken, N. J., assignor to United States Rubber Products, Inc., New York, N. Y.
2,122,596. **Sprinkler.** C. E. Turner, Los Angeles, Calif., assignor to March Automatic Irrigation Co., Muskegon, Mich.
2,122,691. **Abrasive Article.** J. N. Kuzmick, Passaic, and L. S. Hilton, Bloomfield, assignors to Raybestos-Manhattan, Inc., Passaic, both in N. J.
2,122,715. **Comb and Hair Liquid Device.** J. W. Forte, Brooklyn, N. Y.
2,122,736. **Tire.** P. M. Bourdon, Paris, assignor to Michelin & Cie, Clermont-Ferrand, both in France.
2,122,740. **Valve Stem.** A. E. Eckenroth, Denver, Colo.
2,122,743. **Mop.** D. H. Hasse, Cleveland, O.
2,122,809. **Heel Protector.** C. H. Daniels, Wellesley Hills, Mass.
2,122,838. **Coupling.** F. M. Guy, assignor to Guy & Murton, Inc., both of Detroit, Mich.
2,122,867. **Footwear Antislip Device.** F. Marziani, Brooklyn, N. Y.
2,122,897. **Compressed Gas Dispenser.** C. C. Straw, Ansonville, Pa., assignor to Oxygen Equipment & Service Co., Chicago, Ill.
2,122,968. **Container.** H. E. Townsend, Brooklyn, N. Y.; Title Guarantee & Trust Co. executor of the estate of said H. E. Townsend, deceased.
2,122,999. **Support.** L. J. Burke, Chicago, Ill.
2,123,004. **Pedal Slot Closure.** E. J. Farkas, Detroit, assignor to Ford Motor Co., Dearborn, both in Mich.
2,123,135. **Shoe Construction.** C. L. Daly, Belmont, assignor to Daly Bros. Shoe Co., Inc., Boston, both in Mass.
2,123,146. **Fan.** E. S. Preston, assignor to Chicago Electric Mfg. Co., both of Chicago, Ill.
2,123,172. **Vehicle Screen.** I. H. Hedlund, Sioux City, Iowa.
2,123,180. **Sheet Material.** E. A. Corbin, Jr., Gradyville, Ky., and E. W. Wolf, Philadelphia, assignors of one-third to W. C. Biddle, Lansdowne, both in Pa.
2,123,208. **Fly Structure for Overalls, Etc.** S. Rosenthal, Cleveland, O.
2,123,307. **Coupling.** H. Kattwinkel, Coswig, Germany.
2,123,343. **Finger Cot.** E. F. Rightsell, Durham, N. C.
2,123,379. **Brake.** H. T. Pfeiffer, Woodlawn, Md.
2,123,406. **Fountain Pen.** F. C. Deli, assignor to Autopoint Co., both of Chicago, Ill.
2,123,418. **Scalp Treatment Helmet.** L. M. Crosley and F. E. Johnston, assignors to Crosley Radio Corp., all of Cincinnati, O.
2,123,421. **Hair Curler.** E. Kahn, New York, N. Y.
2,123,427. **Fountain Pen.** R. B. Kingman, Orange, N. J., assignor, by mesne assignments, to Camel Pen Co., a corporation of N. J.
2,123,469. **Device to Place Coverings Automatically on Seats of Water Closets.** C. Joriot, Lac-ou-Villers, France.
2,123,524. **Tire Valve Tool.** G. F. Colley, assignor to Merchants & Manufacturers, Inc., Jacksonville, Fla.
2,123,603. **Horn Protector.** B. W. Henderson, Montclair, N. J.
2,123,616. **Undergarment.** H. Van Praag, New York, N. Y.
2,123,644. **Fruit Pitter.** P. Wormser, assignor to Sussman, Wormser & Co., both of San Francisco, Calif.
2,123,730. **Arch Supporter.** F. Huttleston, Marysville, assignor of one-half to L. J. Francis, Yuba City, both in Calif.
2,123,861. **Tractor Wheel.** J. W. Shields, assignor to Firestone Steel Products Co., both of Akron, O.

Dominion of Canada

374,366. **Electric Conductor.** Canadian General Electric Co., Ltd., assignee of O. B. Crowell and F. A. McGregor, co-inventors, all of Toronto, Ont.
374,467. **Belting Dressing.** H. V. Dyke, Auckland, New Zealand.
374,481. **Overshoe.** H. Malm, New York, N. Y., U. S. A.
374,530. **Sanderplane.** American Floor Surfacing Machine Co., assignee of H. L. Myers, Toledo, O., U. S. A.
374,555. **Tire.** Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont., assignee of D. Parkinson, Birmingham, England.
374,613. **Cam Mechanism.** H. Dreyfus, London, assignee of E. Kinsella, Spondon, both in England.
374,625. **Tire.** G. A. Cotton, Hebden Bridge, England.
374,649. **Elastic Undergarment.** C. J. Sanders, New York, N. Y., U. S. A.
374,652. **Flower Exhibiting Device.** R. W. Simpson, New York, N. Y., U. S. A.
374,752. **Electric Cable.** Pyroxylin Products, Inc., assignee of E. W. Trolander and W. C. Wilson, co-inventors, all of Chicago, Ill., U. S. A.
374,761. **Ski Binder.** H. Thorens Société Anonyme, assignee of E. Lecoultre, both of Sainte-Croix, Switzerland.
374,767. **Loom.** H. Dreyfus, London, assignee of F. C. Hale, Spondon, both in England.
374,796. **Tire.** C. Putnam, Norristown, Pa., U. S. A.
374,967. **Faucet Connection.** B. H. Kennedy, Pittsford, N. Y., U. S. A.
374,976. **Vehicle with Variable Tire Tread Surfaces.** P. Michael, Leipzig, Germany.

United Kingdom

480,014. **Stud Fastenings.** G. A. Harvey & Co., (London), Ltd., and R. W. Ransome.
480,021. **Device to Connect Pipes to Containers.** E. W. Mayner.
480,032. **Knitted Fabrics.** Wildt & Co., Ltd., and H. H. Holmes.
480,058. **Vehicle Driving Gear and Wheel Suspension.** Briggs Mfg. Co.
480,079. **Tire.** F. W. Heusinkveld.
480,116. **Piston Packing.** Tuck & Co., Ltd., and J. S. C. Weir.
480,141. **Vacuum Cleaners.** Air-Way Electric Appliance Corp.
480,168. **Conveyers.** H. V. Schweitzer.
480,181. **Labeling Machines.** A. L. Flower.
480,186. **Paving.** I. B. M. Hamilton and Enfield Stone Co., Ltd.
480,210. **Airplane Structure.** L. Renault.
480,218. **Drawing Apparatus for Spinning Machines.** J. Du R. De Blicquy.
480,220. **Tires.** C. Putnam.
480,226. **Tires.** Michelin & Cie.
480,255. **Compound Glass.** W. W. Triggs, (Hercules Safety Glass Co., Ltd.).
480,277. **Wheel Brakes.** Dunlop Rubber Co., Ltd., G. E. Beharrell, J. Wright, and H. Trevaskis.
480,337. **Rotary Elevators.** A. Hoy & Co., Ltd., and J. I. Philp.
480,473. **Respiratory Masks.** V. Horak.
480,599. **Compound Fabrics.** British Belting & Asbestos, Ltd., and E. N. Sisman.
480,600. **Spectacles.** G. Neumann.
480,611. **Hair Waving Appliances.** M. Calderon and Osborne, Garrett & Co., Ltd.
480,614. **Traveling Bags.** H. Bellau.
480,642. **Dress Shields.** M. Isaac.
480,654. **Knife Protector.** F. Stenvers.
480,695. **Hair Curling Appliances.** J. Goodman.
480,696. **Hair Curling Appliances.** W. Huppert.
480,699. **Paper Making Machine Press Roller.** D. W. Ambridge.
480,701. **Chocolate Mold.** H. Le Cerf.
480,710. **Respiratory Mask.** Marconi's Wireless Telegraph Co., Ltd., and J. Stewart.
480,715. **Cutting Blocks.** United Shoe Machinery Corp.
480,796. **Toy.** L. Marx & Co., Ltd., (L. Marx & Co., Inc.).
480,810. **Respiratory Appliance.** J. F. E. Basset.
480,814. **Handle-Bar Grip.** A. G. Barrett and John Bull Rubber Co., Ltd.
480,815. **Rock Drill.** British Flottmann Drill Co., Ltd., (Flottmann A.G.).
480,817. **Oil Well Casing-Head.** N. Matheson.
480,845. **Brush Handle.** W. J. Tennant, (Firm of L. Mamel).
480,875. **Cleansing Pads.** M. I. Reach.
480,941. **Horseshoe.** O. Mioen.
480,965. **Fountain Pen.** Mabie, Todd & Co., Ltd., L. W. Johnson, and E. S. Sears.
480,990. **Universal Joint.** L. W. Meyer, (Thompson Products, Inc.).
480,995. **Paper Doll.** G. L. De Mott.
481,002. **Transformer.** E. J. Ries.
481,014. **Water Wheel.** P. G. L. Daniel.
481,022. **Electromagnetic Switch.** A. Cianchi.
481,055. **Vacuum Cleaner.** Air-Way Electric Appliance Corp.
481,074. **Ice Making Device.** General Motors Corp.
481,075. **Electric Lamp Holder.** P. Leo.
481,083. **Device to Cut and Disperse Substances.** A. Duckham, H. J. Cass, and A. Duckham & Co., Ltd.
481,104. **Leather Working Machine.** Tanning Process Co.
481,111. **Pen Stand.** F. B. Dehn, (Parker Pen Co.).
481,121. **Apparatus to Resolve Petroleum Emulsions by an Electric Field.** H. Passler and A. Brunnbauer.
481,155. **Stuffing Box Packings.** G. Angus & Co., Ltd., (H. Freudenberg).
481,196. **Battery.** F. MacCallum and A. H. Redfern.
481,209. **Razor Blade Cleaner.** L. N. Cox, (I. Morris).
481,228. **Locking Nuts.** Soc. De Boulonnerie Et De Matricage De Precision.
481,237. **Drying Machines.** S. P. H. E. Holgersson.
481,241. **Paper Feeding Apparatus.** J. Dickinson & Co., Ltd.
481,242. **Supporting Conductors.** K. T. Hardman.
481,244. **Ice Pack.** J. D. Bates.

481,252. **Printing Surface.** H. Wolff.
481,254. **Projectile.** M. Chevrier.
481,297. **Toy Blocks.** Premo Rubber Co., Ltd., and A. Levy.
481,313. **Valves.** Dunlop Rubber Co., Ltd., J. Wright, and H. Trevaskis.
481,331. **Stuffing Box Packing.** G. Angus & Co., Ltd.
481,339. **Engine Cylinder.** E. Bugatti.
481,340. **Valve Gear.** E. Bugatti.
481,376. **Device to Support Plants.** R. G. Furley.
481,385. **Closet.** Austral Cabinet Co., Ltd., and H. J. Newnes
481,387. **Hangar Sliding Doors.** Dunlop Rubber Co., Ltd., and A. Lakeman.
481,403. **Couplings.** Ateliers De Constructions Electriques De Charleroi.
481,411. **Waist Band.** I. Shuttleworth and Prices, Tailors, Ltd.
481,428. **Compound Sheet Materials.** A. F. Burgess, (Marathon Paper Mills Co.).
481,474. **Valve Gear.** H. F. P. Purday and F. E. Rebbeck.
481,479. **Gage.** Dunlop Plantations, Ltd., and M. E. L. Robey.
481,488. **Toothbrush.** E. Lorentz.
481,490. **Insole.** Stedfast Rubber Co., Inc.
481,550. **Device to Treat Fiber Web.** Ateliers H. Duesberg-Bosson Soc. Anon.
481,587. **Printers' Blankets.** Dewey & Almy, Ltd., (Dewey & Almy Chemical Co.).
481,603. **Combined Cushion and Lifebelt.** G. R. Shaw.
481,605. **Bowden Mechanism.** Manlove, Alliott, & Co., Ltd., and J. M. Hodges.
481,606. **Coated Fabrics.** Winn & Coales, Ltd., and F. B. Coales.
481,610. **Waterproof Fabrics.** G. H. Ellis and E. Stanley.
481,613. **Seat Back.** G. R. Shaw
481,616. **Bathing Cap.** C. Coleman, Ltd., and C. Coleman.
481,640. **Tables with Ash Receptacles.** P. Kavanagh.
481,656. **Photo-Electric Exposure Meters.** H. E. Dixon, (Metrawatt A.G. Fabrik Elektrischer Messgeraete).
481,677. **Laundry Bags.** W. Pusey.
481,704. **Hair Curler.** J. Coggans and R. Kelso.
481,706. **Door Stops.** Getefo Ges. Fur Technischen Fortschritt.
481,707. **Pulley.** United States Rubber Products, Inc.
481,734. **Wheel Tires.** S. P. Shaw.
481,762. **Pistons.** Soc. D'Inventions Aeronautiques Et Mecaniques S. I. A. M.
481,765. **Powder Blower.** E. Kain and R. O. Griffith.
481,824. **Mop.** Briggs, Emmott & Co., Ltd., W. Banham, and G. B. Neal.
481,839. **Bottle Crate.** J. H. M. Brett and R. Ransom.
481,871. **Compound Sheets.** C. E. Every-Clayton, (Soc. de Progres Technique).
481,880. **Bandage Packing.** M. Samuel.
481,902. **Vacuum Cleaner Silencer.** Hoover Holding Co., Ltd., (Hoover Co.).
481,977. **Pantie-Girdle.** R. W. Spain.
482,177. **Motor Compressor.** General Motors Corp.
482,368. **Sole Leveling Machine.** Compo Shoe Machinery Corp.
482,411. **Hat Finishing Machine.** M. Casse.
482,436. **Compound Sheet Material.** Shellmar Products Co.
482,452. **Baby Pants.** Radium-Gummiwerke Ges. and F. C. Tillmann.
482,522. **Device to Treat Textile Articles with Liquids.** British Schuster Bates Machine Co., Ltd., (F. Schuster).
482,564. **Undervest.** J. Jouve.
482,645. **Bust Support.** E. Lumsden.
482,681. **Wheels.** Dunlop Rubber Co., Ltd., and C. E. Goodyear.
482,688. **Tires.** J. Schytil.
482,721. **Wheels.** India Rubber, Gutta Percha & Telegraph Works Co., Ltd., and F. J. Tarris.
482,818. **Non-Crease Fabrics.** Soc. of Chemical Industry in Basle.

Germany

661,265. **Packing Ring.** Buderus'sche Eisenwerke, Wetzlar.
661,438. **Hose.** Kalle & Co., A.G., Wiesbaden-Biebrich.
661,463. **Hot Water Bottles.** H. Schuhknecht and W. Schemuth, both of Hamburg.
661,501. **Knee Protector.** Friedrich Niehaus & Co., Essen.
661,681. **Sheet Rubber.** A. von Ledofsky and J. Graber, both of Pressburg, Czechslovakia. Represented by B. E. von Bornegg, Berlin.
662,251. **Compressed Air Atomizer.** E. Goldschmidt, Berlin-Schoneberg.
662,252. **Inhaling Device.** L. P. Sene, Boulogne-sur-Seine, France. Represented by A. Berglein, Hamburg.

TRADE MARKS

United States

357,673. **Royalite.** Cable. United States Rubber Products, Inc., New York, N. Y.
357,759. **DuraLatex.** Elastic threads and yarns. R. Steigman, doing business as Duralatex Co., New York, N. Y.
357,760. **SuperLatex.** Elastic threads. R. Steigman, doing business as Superlatex Co., New York, N. Y.
357,773. **Richtex.** Wearing apparel, druggists' sundries, and footwear. B. F. Goodrich Co., New York, N. Y.
357,785. Representation of an auto and the words: **"Red Auto."** Tar remover, hydraulic brake fluid, shock absorber fluid, radiator cleaner, etc. B. F. Goodrich Co., Akron, O.
357,786. Representation of an auto and the words: **"Red Auto."** Automobile greases and oils. B. F. Goodrich Co., Akron, O.
357,797. **Ethyl Selenac.** Accelerator. R. T. Vanderbilt Co., Inc., New York, N. Y.
357,859. **Razzle Dazzle.** Footballs and basketballs. M. Newman Co., New Haven, Conn.
357,860. **Darex.** Bladders for basketballs, footballs, etc. Dewey & Almy Chemical Co., Cambridge, Mass.
357,893. Representation of a label showing leaping fish and the words: **"Water Wear."** Toys for beach and swimming. United States Rubber Products, Inc., New York, N. Y.
357,902. **Aristocrat.** Elastic fabrics. Providence Braid Co., Pawtucket, R. I.
357,919. **Marvelflex.** Elastic Fabrics. Lawson Products, Inc., Central Falls, R. I.
358,078. **Moon-Tex.** Prophylactic goods. Killian Mfg. Co., Akron, O.
358,182. **Halter.** Elastic supports for typewriter erasers. W. Roberts Rubber Co., Newark, N. J.
358,239. **Pathfinder.** Automobile robes. Goodyear Tire & Rubber Co., Akron, O.
358,286. **Mo-Lo.** Rubber and cork composition sheets. C. H. Daniels, East Portchester, Conn.
358,421. **X2B.** Rods, sheets, and tubes. American Hard Rubber Co., Hempstead, N. Y.
358,433. Design of stripes containing the words: **"Triple Air Tested Certified Protectors."** Prophylactic goods. M. E. Proctor, doing business as Proctors Products, New Haven, Conn.

OBITUARY

(*Continued from page* 53)

His clubs included Detroit, Athletic, Detroit Country, and Lotus, of New York.

His wife died in 1933. A son survives.

G. E. Emmons

GEORGE E. EMMONS, formerly manager of the Schenectady Works of General Electric Co. and later vice president in charge of manufacturing for the company, died July 1 in Pasadena, Calif., where interment took place July 6. Mr. Emmons, who was born September 9, 1857, in Westchester, Conn., in 1886 joined the Thomson-Houston Electric Co., Lynn, Mass., which in 1892 was merged with the Edison Electric Co. to form the General Electric Co. The deceased remained with the new organization, where his rise was rapid, until his retirement, which took place in 1924.

E. O. Goss

EDWARD OTIS GOSS, president since 1920 of the Scocill Mfg. Co., Waterbury, Conn., of which A. Schrader's Son, valve manufacturer, Brooklyn, N. Y., is a division, died Independence Day after a brief illness. Mr. Goss, who was born in Waterbury on September 29, 1865, and was graduated from Massachusetts Institute of Technology, in 1887, began work with Scovill as a draftsman the next year, and many promotions followed. He was also an executive in other corporations and quite active in local civic life. Besides he belonged to many organizations.

He was married and the father of three sons.

Funeral services were held July 6. Burial was in Riverside Cemetery.

BUSINESS WILL SHOW THE WAY TO encouraging profits when it shows the way out to discouraging prophets.

Market Reviews

CRUDE RUBBER

Commodity Exchange

TABULATED WEEK-END CLOSING PRICES

Futures	May 28	June 25	July 2	July 9	July 16	July 23
June	11.29	13.94	.....	.....	.....	.....
July	11.31	13.96	15.22	15.09	14.95	15.78
Sept.	11.45	14.12	15.35	15.16	15.08	15.85
Dec.	11.63	14.22	15.45	15.27	15.25	15.95
Mar.	11.78	14.37	15.52	15.28	15.34	16.03
May	.....	14.45	15.59	15.35	15.40	16.09
June	.....	.....	15.62	15.39	15.43	16.12
Volume per week (tons) ..	9,780	31,210	40,950	20,400	15,640	17,980

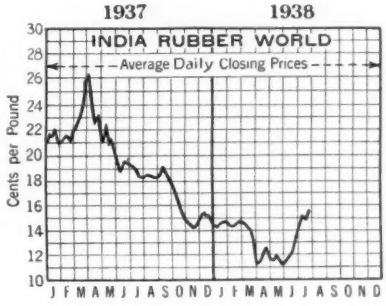
THE Commodity Exchange table published here shows prices of representative future contracts on the New York market the past two months.

The market position of rubber was further strengthened during the past month. After closing at 14.90¢ per pound on June 30, the price of December futures rose to 15.66¢ per pound on July 6. After this, the market was somewhat easier, following the trend of the securities exchange, until the release of June consumption figures on July 15, when the market rallied and advanced on continued buying from foreign accounts, factories, and commission houses, to close at 15.95¢ per pound on July 22. The closing price July 28 was 16.42¢ per pound, a new high for this year. During the past four weeks the maximum variation in week-end closing prices for delivery during the next year was 0.48¢ per pound. Trading during the week ending July 2 was active, amounting to 40,950 tons; while trading during the remainder of the month was only moderate.

At its meeting on July 26 the International Rubber Regulation Committee postponed action on the fourth quarter export quota until its next meeting, September 12. By this time the restriction organization is expected to have a clearer picture of world consuming needs. Prices declined temporarily following the announcement.

While consumption of crude rubber in the United States during June was the largest for any month since November, 1937, the total for the first six months of 1938 was only 171,344 tons, which compares with 312,472 tons during the first half of 1937. From a study of world absorption the Commodity Exchange, Inc., pointed out that this year marks the first time in history that the United States is absorbing less crude rubber per month than is the rest of the world. The drop in volume this year from 1937 has been much more drastic in the United States than abroad; in the United States rubber consumption is less this year than any other year since 1923, whereas abroad rubber absorption is at the highest levels in history with the exception of 1937. On the following page are reported United States statistics on imports, consumption, stocks, and crude rubber afloat.

For the first five months of the year all countries participating in the restriction scheme, exclusive of Siam and French Indo-China, have undershipped their permissible quota by 25,889 tons; Netherland India has a deficiency of 20,666 tons; British Malaya has undershipped its quota by 2,964 tons; while Ceylon has under-shipments of 2,563 tons.



New York Outside Market—Spot Ribbed Smoked Sheets

New York Quotations

New York outside market rubber quotations in cents per pound

	July 27, 1937	June 27, 1938	July 27, 1938
Plantations			
Rubber latex...*gal.*	67/68	54/55	59/60
Paras			
Upriver fine.....	19¾	13¾	15
Upriver fine.....	*25½	*16¼	*16½
Upriver coarse ..	12	9	9
Upriver coarse ...	*18½	*13	*14
Islands fine	19	13	15
Islands fine	*25	*15½	*16½
Acre, Bolivian fine	20	13½	15
Acre, Bolivian fine	*26	*16½	*16½
Beni, Bolivian fine	20½	13¾	15½
Madeira fine	19¾	13¼	15
Caucho			
Upper ball.....	11	9	9¼
Upper ball.....	*16	*13	*14
Lower ball.....	10½	8¾	9
Pontianak			
Pressed block.....	11/31	12/25	11/23
Guayule			
Duro, washed and dried	15	10½	12
Ampar	15½	11	12½
Africans			
Rio Nuñez	20½	15	17
Black Kassai	19¾	15	16½
Prime Niger flake.	26½	24	25
Gutta Percha			
Gutta Siak	10½	11½	12
Gutta Soh.....	19	16	14½
Red Macassar	1.10/1.20	1.25/1.30	1.10/1.20
Balata			
Block, Ciudad Bolivar	31	27	..
Manaos block	28	27	29
Surinam sheets ..	38	37	37
Amber	41	39	39

*Washed and dried crepe. Shipments from Brazil.

New York Outside Market

Activity on the outside market during July was considerably improved over the preceding month. Throughout the past month a fair amount of factory and shipment business was reported. After closing at 14$\frac{11}{16}$¢ per pound on June 30, the price of ribbed smoked sheets advanced to reach 15$\frac{7}{16}$¢ per pound on July 6. After receding to

New York Outside Market—Spot Closing Prices—Plantation Grades—Cents per Pound

	June, 1938				July, 1938																			
	27	28	29	30	1	2*	4†	5	6	7	8	9*	11	12	13	14	15	16*	18	19	20	21	22	23*
No. 1 Ribbed Smoked Sheet	14⅛	13⅞	14⅛	14⅛	15¼	..	..	14¾	15⅞	15⅞	15⅛	..	14¾	15⅛	15⅛	14⅞	15⅛	..	15⅞	15⅞	15⅛	15⅞	15¼	..
No. 2 Ribbed Smoked Sheet	13¾	13½	14⅛	14⅛	14⅞	..	..	14⅜	15 ·	14¾	14⅛	..	14⅛	14⅛	14⅝	14⅞	14⅝	..	15	15	14⅞	15	15⅛	..
No. 3 Ribbed Smoked Sheet	13⅞	13	13⅛	13⅛	14⅛	..	..	13¾	14⅜	14⅛	14⅛	..	13⅛	14⅛	14	13⅛	14	..	14⅜	14⅜	14¼	14⅜	14⅛	..
No. 4 Ribbed Smoked Sheet	13⅛	12⅞	13⅛	13⅛	14⅛	..	..	13⅝	14¼	14	13⅛	..	13½	13⅛	13⅞	13⅝	13⅛	..	14⅛	14⅛	14⅛	14⅛	14½	..
No. 1 Thin Latex Crepe...	15⅛	14¾	15⅛	15⅛	16⅛	..	..	15⅝	16⅛	15⅞	15⅞	..	15⅝	15⅛	15⅞	15¾	15⅞	..	16¼	16¼	16⅛	16¼	16⅛	..
No. 1 Thick Latex Crepe..	15½	15⅜	16⅛	16⅛	16⅝	..	..	16⅛	16½	16¼	16¼	..	16	16⅛	16¼	16¼	16⅜	..	16⅞	16⅞	16¾	16⅞	17⅛	..
No. 1 Brown Crepe.....	13¼	13	13⅛	13⅛	14⅜	..	..	13⅞	14½	14¼	14⅛	..	13⅛	14⅜	14⅛	13⅛	14⅛	..	14½	14½	14⅜	14½	14⅛	..
No. 2 Brown Crepe.....	13⅛	12⅞	13⅛	13⅛	14¼	..	..	13¾	14⅜	14⅛	14⅛	..	13⅛	14	13⅛	13⅛	13⅛	..	14⅛	14⅛	14⅛	14⅛	14⅜	..
No. 2 Amber.....	13¼	13	13⅛	13⅛	14⅜	..	..	13⅞	14½	14¼	14⅛	..	13⅛	14⅛	14⅛	13⅛	14⅛	..	14⅛	14⅛	14⅛	14⅛	14¾	..
No. 3 Amber.....	13⅛	12⅞	13⅛	13⅛	14¼	..	..	13¾	14⅜	14⅛	14⅛	..	13⅛	14	13⅛	13⅛	13⅛	..	14⅛	14⅛	14⅛	14⅛	14⅜	..
No. 4 Amber.....	12¾	12½	13⅛	13⅛	13⅛	..	..	13⅛	13⅞	13⅜	13⅛	..	13⅛	13½	13⅞	13⅛	13⅞	..	13⅛	13⅛	13⅛	13⅛	14⅛	..
Rolled Brown.....	11⅜	11⅜	12⅛	12⅛	12⅛	..	..	12⅞	12¾	12½	12¾	..	11⅞	12⅛	12⅞	11⅞	12	..	12⅞	12⅞	12⅞	12⅞	12¾	..

*Closed. †Holiday.

14¾¢ per pound on July 11, the price again strengthened on continued buying to close at 15¾¢ per pound on July 22. On July 28 the spot closing price was 16⅛¢ per pound, a new high for the year.

The week-end closing prices on No. 1 ribbed smoked sheets follow: July 2, 15¼¢; July 9, 15⅛¢; July 16, 15⅛¢; July 23, 15¾¢.

RUBBER SCRAP

THE demand for all grades of scrap rubber materially improved during the past month, and indications are that activity will be at a still higher rate during the next few months. The market is firm, with price increases covering a broad range and including all scrap groups with the exception of boots and shoes, the prices of which remain steady at last month's levels.

CONSUMERS' BUYING PRICES

(Carload Lots Delivered Eastern Mills)
June 25, 1938

		Prices
Boots and Shoes		
Boots and shoes, black	lb.	$0.01 /$0.01⅛
Colored	lb.	.00¾/ .00⅞
Untrimmed arctics	lb.	.00¾/ .00⅞
Inner Tubes		
No. 1, floating	lb.	.08½/ .09
No. 2, compound	lb.	.04 / .04¼
Red	lb.	.04 / .04¼
Mixed tubes	lb.	.03¾/ .03⅞
Tires (Akron District)		
Pneumatic Standard		
Mixed auto tires with beads	ton	11.25 /12.00
Beadless	ton	14.50 /15.50
Auto tire carcass	ton	17.00 /18.00
Black auto peelings	ton	17.50 /19.00
Solid		
Clean mixed truck	ton	25.00 /26.00
Light gravity	ton	33.00 /34.00
Mechanicals		
Mixed black scrap	ton	19.00 /22.00
Hose, air brake	ton	19.00 /22.00
Garden, rubber covered	ton	11.00 /12.00
Steam and water, soft	ton	10.00 /10.50
No. 1 red	lb.	.02¾/ .03
No. 2 red	lb.	.01⅞/ .02¼
White druggists' sundries	lb.	.03¾/ .04
Mechanical	lb.	.01¾/ .01½
Hard Rubber		
No. 1 hard rubber	lb	.11¾/ .12½

Tire Production Statistics

	Pneumatic Casings		
	Inventory	Production	Shipments
1936	11,114,399	58,116,349	55,362,739
1937	10,767,799	55,284,415	55,466,329
1938			
Jan.	10,987,967	2,776,046	2,500,148
Feb.	10,833,036	2,238,167	2,359,098
Mar.	10,819,552	2,792,440	2,890,749
Apr.	10,316,774	2,705,606	3,199,363
May	9,855,360	2,841,549	3,372,118
June	8,811,603	3,111,913	4,025,018

	Inner Tubes		
	Inventory	Production	Shipments
1936	10,985,273	57,247,553	54,624,321
1937	10,235,517	51,986,167	52,376,657
1938			
Jan.	10,164,141	2,417,920	2,423,856
Feb.	10,161,093	2,132,013	2,127,260
Mar.	10,129,854	2,474,821	2,544,480
Apr.	9,524,959	2,142,314	2,703,920
May	9,010,245	2,229,719	2,843,354
June	8,106,286	2,680,098	3,571,320

Source: The Rubber Manufacturers Association, Inc. Figures adjusted to represent 100% of the industry.

IMPORTS, CONSUMPTION, AND STOCKS

United States and World Statistics of Rubber Imports, Exports, Consumption, and Stocks

Twelve Months	U. S. Imports* Tons	U. S. Consumption¶ Tons	U. S. Stocks Mfgrs. Importers, Dealers, Etc.† Tons	U. S. Stocks Afloat† Tons	U. K.— Public Warehouses, London Liverpool†‡ Tons	Singapore and Penang Dealers and Port Stocks†‡ Tons	World Production (Net Exports)‡ Tons	World Consumption Estimated‡ Tons	World Stocks†‡§ Tons
1936	490,858	575,000	223,000	56,567	78,462	26,969	855,600	1,044,195	538,028
1937	584,851	543,600	262,204	63,099	57,785	44,792	1,135,029	1,093,916	639,025
1938									
January	42,135	29,429	274,581	57,356	62,108	48,494	80,282	70,019	a634,330
February	43,930	23,868	294,338	47,459	71,516	46,241	81,043	61,003	a653,791
March	35,967	30,487	299,172	41,882	76,617	50,797	81,531	78,286	a670,332
April	30,807	27,984	301,436	39,071	82,754	40,614	86,412	68,158	a668,321
May	27,410	28,947	299,720	32,859	87,215	40,598	64,541	75,308	.....
June	26,011	30,629	294,566	32,079	.....	.....	.....	.....	.....

* Including liquid latex. †Stocks on hand the last of the month or year. ‡Statistical Bulletin of the International Rubber Regulation Committee. §Stocks at U. S. A., U. K., Singapore and Penang, Para, Manaos, regulated areas, and afloat. ¶Corrected to 100% from estimate of reported coverage. **Not including additional absorption from U.K. manufacturers' stocks for any month during 1937. The figure will be included in yearly total. *a* Japan stocks not included.

CRUDE rubber consumption by United States manufacturers during June is estimated at 30,629 long tons, against 28,947 long tons in May, a 5.8% increase, but 40.9% under the 51,860 (revised) long tons consumed in June a year ago, according to R.M.A. statistics.

June gross imports of crude rubber are reported to be 26,011 long tons, 5.1% under the May figure of 27,410 long tons and 46.9% under the June, 1937, figure of 48,956 long tons.

Total domestic stocks of crude rubber on hand June 30 are estimated at 294,566 long tons, compared with May 31 stocks of 299,720 long tons and 172,056 long tons on hand June 30, 1937.

Crude rubber afloat to U. S. ports as of June 30 is figured at 32,079 long tons, against 32,859 long tons afloat on May 31 and 57,215 long tons afloat June 30, 1937.

London and Liverpool Stocks

Week Ended	Tons London	Tons Liverpool
July 2	60,654	31,806
July 9	60,643	31,624
July 16	61,420	32,839
July 23	61,678	32,605

RECLAIMED RUBBER

United States Reclaimed Rubber Statistics—Long Tons

Year	Production	Consumption†	Consumption % to Crude	U. S. Stocks*	Exports
1936	150,571	141,486	24.6	19,000	7,085
1937	185,033	162,000	29.8	28,800	13.233
1938					
Jan.	7,698	6,940	23.6	28,900	658
Feb.	6,198	7,141	29.9	27,487	470
Mar.	6,875	8,471	27.8	25,432	459
Apr.	6,399	7,480	26.7	23,339	426
May	6,866	8,009	27.7	22,275	550
June	7,584	8,274	27.0	21,040	...

*Stocks on hand the last of the month or year. †Corrected to 100% from estimate of reported coverage.
Compiled by The Rubber Manufacturers Association, Inc.

ACCORDING to R.M.A. figures, June reclaimed rubber consumption is estimated at 8,274 long tons, 3.3% over the May figure; production, 7,584 long tons; and stocks on hand June 30, 21,040 long tons. The demand for reclaim during July showed no noticeable improvement over June. With improved sentiment, however, a higher rate of activity is anticipated during the coming months. The relation of stocks on hand to the June consumption figure is such that should the rubber industry pick up so as to increase the monthly consumption, a similar rise in the rate of production would be necessary.

The market is steady, and all grades continue at the prices quoted a month ago.

New York Quotations

July 22, 1938

	Sp. Grav.	¢ per lb.
Auto Tire		
Black Select	1.16-1.18	6 / 6¼
Acid	1.18-1.22	6¾/ 7
Shoe		
Standard	1.56-1.60	6½/ 6¾
Tubes		
No. 1 Floating	1.00 -	12 /12¼
Compound	1.10-1.20	8 / 8¾
Red Tube	1.15-1.30	8 / 8¼
Miscellaneous		
Mechanical Blends	1.25-1.50	4¾/ 5
White	1.35-1.50	11½/12

The above list includes those items or classes only that determine the price basis of all derivative reclaim grades. Every manufacturer produces a variety of special reclaims in each general group separately featuring characteristic properties of quality, workability, and gravity at special prices.

ADVERTISING PAGES REMOVED

COMPOUNDING INGREDIENTS

THE demand for compounding materials during the past month remained generally inactive, with only slight indications of improvement. Purchases have been chiefly limited to amounts sufficient for immediate requirements, giving evidence that buyers' supplies are now at a minimum. It is hoped that the current activity in the securities and commodity markets will stimulate automobile purchases, thus broadening the equipment demand for tires. For the most part prices continue at previously established levels; an advance in pig lead, however, has resulted in price increases for litharge and leaded zinc oxides.

CARBON BLACK. Although July shipments of carbon black slightly increased over those of June, the demand from large consumers remains low. Despite a curtailment in production, consumption continues to lag behind to the extent that only about 80% of recent production is moving into consuming channels. Prices continue in an unchanged position.

FACTICE OR RUBBER SUBSTITUTE. The demand for rubber substitutes showed little change during the past month. Substitutes made from rapeseed oil have decreased in price.

LITHARGE. An advance in pig lead sent the car lot price of litharge up 9/10¢ per pound, the new price for this oxide being 6.40¢ per pound, delivered, except in Ala., Ariz., Ark., Colo., Fla., Ga., Idaho, La., Miss., Mont., Nev., N. Mex., Okla., Tex., Utah, Wyo., and east of the Cascades in Ore., and Wash., where the price is 6.65¢ per pound.

LITHOPONE. The demand for lithopone revealed a small improvement during July. Most of the orders have been for rush shipment, indicating that buyers have little stock on hand. The price continues unchanged at the basis established in June.

RUBBER CHEMICALS. No change occurred in prices of rubber chemicals, or is any alteration in selling schedules anticipated in the near future. Demand has remained low, with indications of slight improvement.

RUBBER SOLVENTS. Solvent consumption by tire manufacturers did not show any noticeable improvement during the past month. Prices continue at levels quoted some time back.

STEARIC ACID. A further advance in tallow was reflected in a firmer tone in the market for stearic acid, but prices were without change. There was a fair movement of acid into consuming channels.

TITANIUM PIGMENTS. Sales have improved since the drop in prices in June and indications are that volume for the past month might exceed that of July last year. Prices for titanium dioxide and the compound pigments remain unchanged.

A Department of Commerce review on titanium white in Japan estimates that total domestic consumption in Japan amounts to approximately 100 metric tons per month, of which 85 metric tons are used by rayon industry. The four firms producing titanium white in Japan are increasing their production facilities which, when completed, will result in a total production of about 340 metric tons a month.

ZINC OXIDE. Prices for 35 and 50% leaded zinc oxides were advanced 0.25 and 0.37¢ per pound, respectively, in July. The 35% leaded oxide is now priced at 5.90¢ per pound for 20 ton lots and 6.15¢ per pound for l.c.l. quantities; while the 50% strength is priced at 5.92¢ per pound in 20 ton lots and 6.17¢ per pound in l.c.l. quantities. These prices are for bag packing; barrels are ¼¢ per pound additional. Other grades continue unchanged.

New York Quotations

July 25, 1938

Prices Not Reported Will Be Supplied on Application

Abrasives			
Pumicestone, powdered	lb.	$0.03	/$0.035
Rottenstone, domestic	lb.	.03	/ .035
Silica, 15	ton	38.00	
Accelerators, Inorganic			
Lime, hydrated, l.c.l., New York	ton	20.00	
Litharge (commercial)	lb.	.0675/	.0725
Accelerators, Organic			
A-1	lb.	.26	
A-5-10	lb.	.35	/ .40
A-7	lb.	.42	/ .55
A-10	lb.	.35	/ .40
A-11	lb.	.52	/ .65
A-19	lb.	.52	/ .65
A-32	lb.	.70	/ .80
A-77	lb.	.42	/ .55
A-100	lb.	.42	/ .55
A-100-F-50	lb.	.25	/ .35
A-433	lb.	.45	/ .55
Accelerator 49	lb.	.42	
737	lb.	.42	/ .43
737-50	lb.	.25	/ .26
808	lb.	.70	/ .72
833	lb.	1.15	
Acrin	lb.	.55	
Aldehyde ammonia	lb.	.65	/
Altax	lb.	.55	/ .65
B-J-F	lb.	.50	/ .55
Beutene	lb.	.70	/ .75
Butyl Zimate	lb.	3.00	
C-P-B	lb.	2.00	
Captax	lb.	.50	/ .60
Crylene	lb.	.40	/ .47
Paste	lb.	.30	/ .36
D-B-A	lb.	2.00	
Di-Esterex	lb.	.60	/ .70
Di-Esterex-N	lb.	.60	/ .70
Di-ortho-tolylguanidine	lb.	.44	/ .46
Diphenylguanidine	lb.	.35	/ .36
DOTG	lb.	.47	
DPG	lb.	.35	/ .45
El-Sixty	lb.	.50	/ .65
Ethylideneaniline	lb.	.42	/ .43
Ethyl Zimate	lb.	3.00	
Formaldehyde P.A.C.	lb.	.0625	
Formaldehydeaniline	lb.	.31	
Formaldehyde-para-toluidine	lb.	.52	/ .54
Guantal	lb.	.40	/ .50
Hepteen	lb.	$0.35	/$0.40
Base	lb.	1.35	/ 1.50
Hexamethylenetetramine U.S.P.	lb.	.47	
Technical	lb.	.36	
Lead oleate, No. 999	lb.	.12	
Witco	lb.	.15	
Monex	lb.	3.00	
Novex	lb.		
O. N. V.	lb.	1.00	/ 1.10
O-X-A-F	lb.	.50	/ .55
Ovac	lb.	.50	/ .55
Para-nitroso-dimethylaniline	lb.	.85	
Pentex	lb.	1.00	/ 1.10
Pip-Pip	lb.	2.50	
Pipsolene	lb.	1.55	/ 1.85
R-2	lb.	1.40	/ 1.80
Base	lb.	3.65	
R-23	lb.	.40	
R & H 50-D	lb.	.42	/ .43
Rotax	lb.	.60	/ .65
Safex	lb.	1.20	/ 1.30
Santocure	lb.	1.05	/ 1.30
Super-sulphur No. 1	lb.	.50	
No. 2	lb.	.20	/ .22
Tetrone A	lb.	3.00	
Thiocarbanilide	lb.	.24	/ .30
Thionex	lb.	3.00	
Trimene	lb.	.55	/ .65
Base	lb.	1.05	/ 1.20
Triphenyl guanidine (TPG)	lb.	.60	
Tuads	lb.	3.00	
Ureka	lb.	.60	/ .75
Blend B.	lb.	.60	/ .75
C	lb.	.56	/ .65
Vulcanex	lb.	.42	/ .43
Vulcanol	lb.	.85	
Z-B-X	lb.	2.50	
Z-88	lb.	.44	/ .60
Z-88-P	lb.	.51	
Zenite	lb.	.46	/ .48
A	lb.	.53	/ .55
B	lb.	.46	/ .48
Zimate	lb.	3.00	
Activator			
Barak	lb.	.50	
Age Resisters			
AgeRite Alba	lb.	1.50	/ 2.10
Exel	lb.	1.00	/ 1.02
Gel	lb.	.57	/ .77
Hipar	lb.	$0.65	/$0.67
HP	lb.		
Powder	lb.	.52	/ .54
Resin	lb.	.52	/ .73
D	lb.	.52	/ .73
Syrup	lb.		
White	lb.	1.25	/ 1.75
Albasan	lb.	.70	/ .75
Aminox	lb.	.52	/ .61
Antox	lb.	.56	
B-L-E	lb.	.52	/ .61
Powder	lb.	.65	/ .74
B-X-A	lb.	.55	/ .61
Copper Inhibitor X-872	lb.	1.15	
Flectol B	lb.	.52	/ .65
H	lb.	.52	/ .65
White	lb.	.90	/ 1.15
M-U-F	lb.	1.50	
Neozone (standard)	lb.	.63	
A	lb.	.52	/ .54
B	lb.	.63	
C	lb.	.52	/ .54
D	lb.	.52	/ .54
E	lb.	.63	
Oxynone	lb.	.64	/ .80
Parazone	lb.	.68	
Perflectol	lb.	.65	/ .75
Permalux	lb.	1.20	
Santoflex A	lb.	.65	/ .75
B	lb.	.52	/ .65
Santowhite	lb.	.95	/ 1.20
Solux	lb.	1.30	
Thermoflex A	lb.	.65	/ .67
V-G-B	lb.	.52	/ .61
Alkalies			
Caustic soda, flake, Columbia (400 lb. drums)	100 lbs.	2.70	/ 3.55
liquid, 50%	100 lbs.	1.95	
solid (700 lb. drums)	100 lbs.	2.30	/ 3.15
Antiscorch Materials			
A-F-B	lb.	.35	/ .40
Antiscorch T	lb.	.90	
Cumar RH	lb.	.09	
R-17 Resin (drums)	lb.	.10	
RM	lb.	1.25	
Retarder W	lb.	.36	
U.T.B.	lb.	.35	/ .40
Antisun Materials			
Heliozone	lb.	.27	
Sunproof	lb.	.27	/ .30

Brake Lining Saturant
B. R. T. No. 3 ..... lb. $0.0165/$0.0175

Colors
BLACK
Du Pont powder ..... lb. .42 / .44
Lampblack (commercial) .... lb. .15
BLUE
Brilliant ..... lb.
Du Pont dispersed ..... lb. .70 / 3.60
Powders ..... lb .45 / 3.75
Prussian ..... lb. .0375
Toners ..... lb. .08 / 3.85
BROWN
Mapico ..... lb. .11
GREEN
Brilliant ..... lb.
Chrome, light ..... lb.
medium ..... lb. .22
oxide (freight allowed) ... lb.
Dark ..... lb.
Du Pont dispersed ..... lb. .87 / 1.60
Powders ..... lb. 1.00 / 2.00
Guignet's, Easton, Pa., bbls. lb. .70
Light ..... lb.
Toners ..... lb. .85 / 3.75
ORANGE
Du Pont dispersed ..... lb. .80 / .90
Powders ..... lb. .80 / 2.50
Lake ..... lb.
Toners ..... lb. .40 / 1.60
ORCHID
Toners ..... lb. 1.50 / 2.00
PINK
Toners ..... lb. 1.50 / 4.15
PURPLE
Permanent ..... lb.
Toners ..... lb. .60 / 2.10
RED
Antimony
Crimson, 15/17% ..... lb. .45
R. M. P. No. 3 ..... lb. .48
Sulphur free ..... lb. .50
R.M.P. ..... lb. .52
Golden 15/17% ..... lb. .28
7-A ..... lb. .37
Z-2 ..... lb. .23
Aristi ..... lb. 1.75
Cadmium, light (400 lb. bbls. ..... lb. .70 / .75
Chinese ..... lb.
Crimson ..... lb.
Du Pont dispersed ..... lb. .85 / 2.05
Powders ..... lb. .30 / 1.40
Mapico ..... lb. .0925
Medium ..... lb.
Rub-Er-Red, Easton, Pa., bbls. ..... lb. .0925
Scarlet ..... lb.
Toners ..... lb. .08 / 2.00
WHITE
Lithopone (bags) ..... lb. .04½ / .04¾
Albalith Black Label-11 .. lb. .04½ / .04¾
Astrolith ..... lb. .04½ / .04¾
Azolith ..... lb. .04½ / .04¾
Cryptone-19 ..... lb. .05⅝ / .05¾
CB-21 ..... lb. .05⅝ / .05¾
ZS No. 20 ..... lb. .08⅜ / .08⅝
No. 86 ..... lb. .08⅜ / .08⅝
No. 230 ..... lb. .08⅜ / .08⅝
Sunolith ..... lb. .04½ / .04¾
Ray-Bar ..... lb. .05⅝ / .06⅛
Ray-Cal ..... lb. .05⅝ / .06⅛
Rayox ..... lb. .15 / .18
Titanolith (5-ton lots) ..... lb. .05⅝ / .05¾
Titanox-A (50-lb. bags) ..... lb. .15 / .1525
B (50-lb. bags) ..... lb. .05⅝ / .05¾
B-30 (50-lb. bags) ..... lb. .05⅝ / .05¾
C (50-lb. bags) ..... lb. .05⅝ / .05¾
M ..... lb.
Ti-Tone ..... lb.
Zinc Oxide
Anaconda, Green Seal No. 333 ..... lb. .08 / .085
Lead Free No. 109 .... lb. .0625/ .0675
No. 116 ..... lb. .0625/ .0675
No. 352 ..... lb. .075 / .08
No. 570 ..... lb. .075 / .08
No. 577 ..... lb. .075 / .08
Red Seal No. 222 ..... lb. .075 / .08
U.S.P. No. 777 (bbls.) lb. .095 / .0975
White Seal No. 555 ... lb. .085 / .09
Aso ZZZ-11 ..... lb. .0625/ .065
44 ..... lb. .0625/ .065
55 ..... lb. .0625/ .065
66 ..... lb. .0625/ .065
French Process, Florence
White Seal-7 (bbls.) ... lb. .085 / .0875
Green Seal-8 ..... lb. .08 / .0825
Red Seal-9 ..... lb. .075 / .0775
Kadox, Black Label-15 .. lb. .065 / .0675
No. 25 ..... lb. .075 / .0775
Red Label-17 ..... lb. .065 / .0675
Horse Head Special 3 ... lb. .0625/ .065
XX Red-4 ..... lb. .0625/ .065
23 ..... lb. .0625/ .065
72 ..... lb. .0625/ .065
78 ..... lb. .0625/ .065
80 ..... lb. .0625/ .065
103 ..... lb. .0625/ .065
110 ..... lb. .0625/ .065
St. Joe (lead free)
Black Label ..... lb. .0625/ .065
Green Label ..... lb. .0625/ .065
Red Label ..... lb. .0625/ .065
U.S.P. ..... lb. $0.095 /$0.0975
White Jack ..... lb. .08⅜/ .08⅝
Zopaque (bags) ..... lb. .15 / .1575
YELLOW
Cadmolith (cadmium yellow), 400 lb. bbls. ..... lb. .45 / .50
Du Pont dispersed ..... lb. 1.25 / 1.60
Powders ..... lb. .70 / 1.37
Lemon ..... lb.
Mapico ..... lb. .0675
Toners ..... lb. 2.50

Dispersing Agents
Bardol ..... lb. .0215/ .024
Darvan ..... lb. .30 / .50
Nevoll (drums) ..... lb. .0215
Santomerse S ..... lb. .11 / .25

Fillers, Inert
Asbestine, c.l., f.o.b., mills. ton 15.00
Barytes ..... ton 30.00 /36.00
f.o.b., St. Louis (50 lb. paper bags) ..... ton 22.85
off color, domestic ..... ton 20.00 /25.00
white, imported ..... ton 29.00 /32.00
Blanc fixe, dry, precip. .... lb. .03 / .035
Calcene ..... ton 37.50 /43.00
Infusorial earth ..... lb. .02 / .03
Kalite No. 1 ..... ton 24.00 /50.00
No. 3 ..... ton 34.00 /60.00
Magnesia, calcined, heavy .. lb. .04
Carbonate, l.c.l. ..... lb. .07 / .095
Pyrax A ..... ton 7.50 /20.00
Whiting
Columbia Filler ..... ton 9.00 /14.00
Guilders ..... 100 lbs.
Hakuenka ..... lb.
Paris white, English cliff-stone ..... 100 lbs.
Southwark Brand, Commercial ..... 100 lbs.
All other grades ... 100 lbs.
Suprex, white extra light .. ton 45.00 /60.00
heavy ..... ton 45.40 /60.00
Witco, c.l. ..... ton 6.00

Finishes
IVCO lacquer, clear ..... gal. 1.55 / 2.55
colors ..... gal. 2.60 / 3.25
Rubber lacquer, clear ..... gal.
colored ..... gal.
Starch, corn, pwd. .... 100 lbs.
potato ..... lb.
Talc ..... ton 25.00 /45.00

Flock
Cotton flock, dark ..... lb. .11 / .13
dyed ..... lb. .45 / .85
white ..... lb. .18 / .20
Rayon flock, colored ..... lb. 1.10 / 2.00
white ..... lb. .90

Latex Compounding Ingredients
Accelerator 85 ..... lb. .35
89 ..... lb. 1 40
122 ..... lb. 1.55
552 ..... lb. 2.50
Aerosol ..... lb. .45
Antox, Dispersed ..... lb. .42
Aquarex A ..... lb. .35
D ..... lb. .75
F ..... lb. .85
Areskap No. 50 ..... lb. .18 / .24
No. 100, dry ..... lb. .39 / .51
Aresket No. 240 ..... lb. .16 / .22
No. 300, dry ..... lb. .42 / .50
Aresklene No. 375 ..... lb. .35 / .50
No. 400, dry ..... lb. .51 / .65
Black No. 25, Dispersed ... lb. .22 / .40
Catalpo ..... ton
Color Pastes, dispersed ..... lb. .35 / 1.75
Dispersex No. 15 ..... lb. .11 / .12
No. 20 ..... lb. .08 / .10
Emo, brown ..... lb. .15
white ..... lb. .15
Factice Compound, Dispersed ..... lb. .36
Heliozone, Dispersed ..... lb. .25
Igepon A ..... lb.
MICRONEX, Colloidal .... lb. .055 / .07
Nekal BX (dry) ..... lb.
Palmol ..... lb. .10
Pipsol X ..... lb. 3.05 / 3.55
R-23 ..... lb. .57
RN-2 ..... lb. 1.40 / 1.80
S.1 (400 lb. drums) ..... lb. .65
Santomerse S ..... lb. .11 / .25
D ..... lb. .41 / .65
Santovar A ..... lb. 1.15 / 1.40
Stablex A ..... lb. .90 / 1.10
B ..... lb. .65 / .90
C ..... lb. .40 / .50
Sulphur, Dispersed ..... lb. .10 / .15
No. 2 ..... lb. .075 / .15
T.1. (400 lb. drums) ..... lb. .40
Tepidone ..... lb. 1.75
Vulcan Colors ..... lb.
Zinc oxide, dispersed ..... lb. .12 / .15

Mineral Rubber
B. R. C. No. 20 ..... lb. .009 / .01
Black Diamond ..... ton 25.00
Genasco Hydrocarbon, granulated, (fact'y) ... ton
solid ..... ton
Gilsonite Hydrocarbon (factory) ..... ton
Hydrocarbon, hard ..... ton 22.00 /42.00
Parmr Grade 1 ..... ton 25.00 /27.00
Grade 2 ..... ton 25.00 /27.00
Pioneer ..... ton
285°-300° ..... lb. $22.00 /$42.00

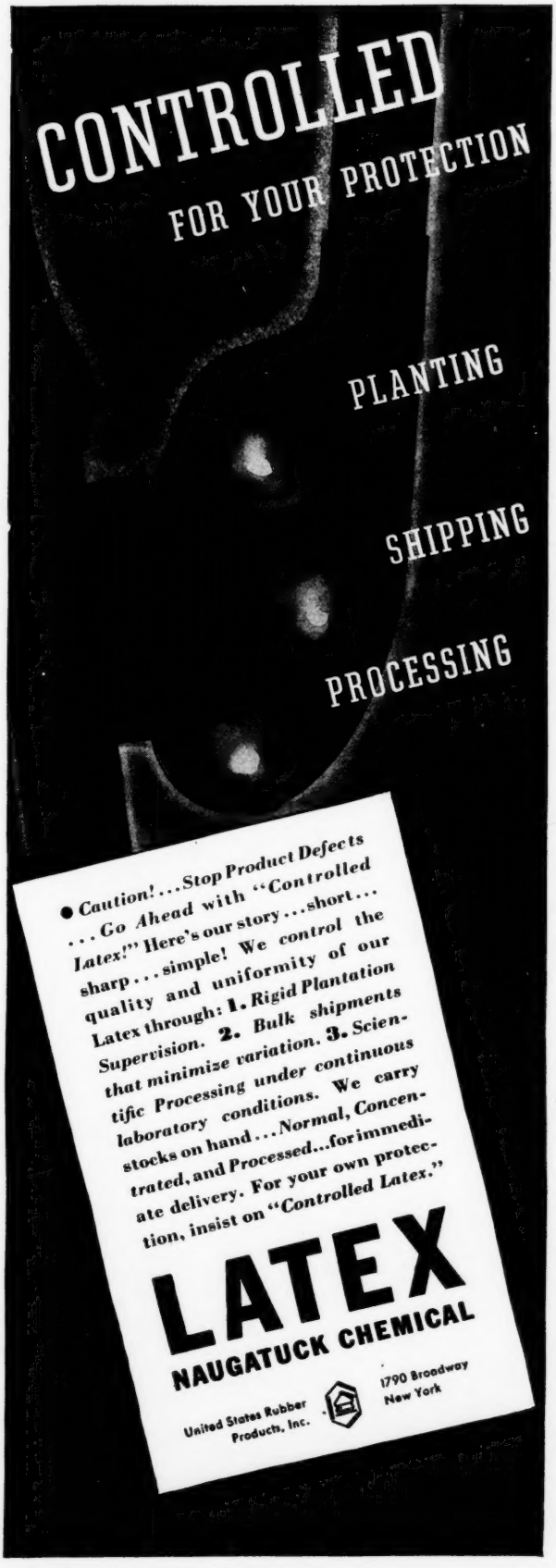
Mold Lubricants
Lubrex ..... lb. .25 / .30
Mold Paste ..... lb. .12 / .18
Sericite ..... ton 65.00 /75.00
Soapbark ..... lb.
Soapstone ..... ton 25.00 /35.00

Oil Resistant
AXF ..... lb. .40 / .45

Reclaiming Oils
B. R. V. ..... lb. .03 / .0325
S. R. O. ..... lb. .0175/ .0185

Reenforcers
Carbon Black
Aerfloted Arrow Specification Black ..... lb.
Arrow Compact Granulized Carbon Black ..... lb.
"Certified" Heavy Compressed, Cabot ..... lb.
Spheron ..... lb.
Continental Dustless, c.l. lb. .0275/ .0375
Compressed c.l. ..... lb. .0275/ .0375
Uncompressed, c.l. .... lb. .0275/ .0375
Disperso, c.l. ..... lb. .0275/ .0375
Dixie, c.l., f.o.b. New Orleans, La., Galveston or Houston, Tex. .... lb. .0275
c.l., delivered New York. lb. .0375
local stock, bags, delivered ..... lb. .0625
Dixiedensed, c.l., f.o.b., New Orleans, La., Galveston or Houston, Tex. .... lb. .0275
c.l., delivered New York. lb. .0375
local stock, bags, delivered ..... lb. .0625
Dixiedensed 66, c.l. f.o.b. New Orleans, La., Galveston or Houston, Tex. ..... lb. .0275
c.l., delivered New York. lb. .0375
local stock, bags, delivered ..... lb. .0625
Excello, c.l., f.o.b. Gulf ports ..... lb. .0275/ .0475
delivered New York... lb. .0375/ .0575
l.c.l., delivered New York ..... lb. .0625/ .07
Fumonex, c.l., f.o.b. works. lb. .03
ex-warehouse ..... lb. .045
Gastex ..... lb. .03 / .07
Kosmobile, c.l., f.o.b. New Orleans, La., Galveston or Houston, Tex. .... lb. .0275
c.l., delivered New York. lb. .0375
local stock, bags, delivered ..... lb. .0625
Kosmobile 66, c.l., f.o.b. New Orleans, La., Galveston or Houston, Tex. ..... lb. .0275
c.l., delivered New York. lb. .0375
local stock, bags, delivered ..... lb. .0625
Kosmos, c.l., f.o.b. New Orleans, La., Galveston or Houston, Tex. .... lb. .0275
c.l., delivered New York. lb. .0375
local stock, bags, delivered ..... lb. .0625
MICRONEX Beads, c.l., f.o.b. Gulf ports.. lb. .0275
c.l., delivered, New York ..... lb. .0375
local stock, bags, delivered ..... lb. .0625
Mark II, c.l., f.o.b. Gulf ports ..... lb. .0275
c.l., delivered, New York ..... lb. .0375
local stock, bags, delivered ..... lb. .0625
Standard, c.l., f.o.b. Gulf ports ..... lb. .0275
c.l., delivered, New York ..... lb. .0375
local stock, bags, delivered ..... lb. .0625
W-5, c.l., f.o.b., Gulf ports ..... lb. .0275
c.l., delivered, New York ..... lb. .0375
local stock, bags, delivered ..... lb. .0625
W-6, c.l., f.o.b., Gulf ports ..... lb. .0275
c.l., delivered, New York ..... lb. .0375
local stock, bags, delivered ..... lb. .0625
Paradene No. 2 (drums). lb. .04
Pelletex ..... lb. .03 / .07
Supreme, c.l., f.o.b. Gulf ports ..... lb. .0275/ .0475
delivered New York... lb. .0375/ .0575
l.c.l. delivered New York ..... lb. .0625/ .07
"WYEX BLACK" ..... lb.
Carbonex (bags) ..... lb. .029 / .0315
"S" (bags) ..... lb. .0315/ .034

(Continued on page 76)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Regular and Special Constructions of

COTTON FABRICS

Single Filling Double Filling and

ARMY

Ducks

HOSE and BELTING

Ducks

Drills

Selected

Osnaburgs

Curran & Barry
320 BROADWAY
NEW YORK

COTTON AND FABRICS

THE accompanying table of week-end closing prices on the New York Cotton Exchange shows the week-end change of representative futures covering the past two months.

The New York spot middling price closed at 9.01¢ per pound on July 1, and during the next week the price rose steadily, influenced by estimates of the forthcoming government acreage report, to close at 9.17¢ on July 8. During the reaction following publication of the report, the price fell off to 8.64¢ on July 16, after which it recovered to 8.88¢ on July 21. The closing price on July 28 was 8.67¢ per pound.

NEW YORK COTTON EXCHANGE WEEK-END CLOSING PRICES

Futures	May 28	June 25	July 2	July 9	July 16	July 23
June	7.89	....	....	....	....	....
July	7.92	8.75	9.02	8.98	....	....
Sept.	7.92	8.75	9.01	8.96	8.57	8.80
Dec.	7.94	8.83	9.09	9.02	8.68	8.91
Mar.	7.96	8.88	9.16	9.08	8.73	8.98
May	....	8.93	9.19	9.11	8.76	9.02
June	....	....	....	....	....	9.04

Sales at 13 southern markets totaled 90,529 bales during 17 days since June 29, against 18,555 bales for the same days one year ago.

Consumption of all cotton in domestic mills totaled 442,742 bales during June, against 425,684 in May and 680,521 in June, 1937, according to a report of the Census Bureau.

The acreage planted to cotton as of July 1 was estimated by the Crop Reporting Board of the Department of Agriculture at 26,904,000 acres; 22% under the 1937 acreage and the lowest acreage ever planted to cotton since 1900.

Fabrics

The cotton textile market gave indications of steady improvement during the past month with continuing demand for fabrics, chiefly for deliveries over the balance of this year. Some interest has developed in deliveries for the first quarter of 1939. Textile manufacturers are reluctant to bind themselves for 1939 deliveries at prevailing prices. The demand for raincoat fabrics, which was reported as being good, has been influenced by the seasonal demand and the recent heavy rains. After being active during the early part of July, the sheeting market became quiet, but renewed buying is anticipated in the near future.

Tire fabric prices all receded ½¢ per pound; raincoat fabrics advanced ¼¢ per yard; fractional gains were made by sheetings; while Hollands remained steady. There were a few fractional changes registered in the other fabric groups.

New York Quotations

July 25, 1938

Drills		
38-inch 2.00-yard	yd.	$0.10¾
40-inch 3.47-yard		.06½
50-inch 1.52-yard		.14½
52-inch 1.85-yard		.12
52-inch 1.90-yard		.11¾
52-inch 2.20-yard		.10¾
52-inch 2.50-yard		.09
59-inch 1.85-yard		.11½
Ducks		
38-inch 2.00-yard D. F.	yd.	.10½/.10¾
40-inch 1.45-yard S. F.		.15
51½-inch 1.35-yard D. F.		.15½
72-inch 1.05-yard D. F.		.21½/.22
72-inch 17.21-ounce		.23½
Mechanicals		
Hose and belting	lb.	.24
Tennis		
52-inch 1.35-yard	yd.	.16¼
Hollands		
Gold Seal and Eagle		
20-inch No. 72	yd.	.09
30-inch No. 72		.16
40-inch No. 72		.18
Red Seal and Cardinal		
20-inch	yd.	.07½
30-inch		.13¾
40-inch		.15
50-inch		.24
Osnaburgs		
40-inch 2.34-yard	yd.	.09¼
40-inch 2.48-yard		.08¾
40-inch 2.56-yard		.08½
40-inch 3.00-yard		.07¼
40-inch 7-ounce part waste		.06¾
40-inch 10-ounce part waste		.09¾
37-inch 2.42-yard		.08⅞
Raincoat Fabrics		
Cotton		
Bombazine 60 x 64	yd.	.07½
Plaids 60 x 48		.10
Surface prints 60 x 64		.11
Print cloth, 38½-inch, 60 x 64		.04⅝
Sheetings, 40-inch		
48 x 48, 2.50-yard	yd.	.07⅜
64 x 68, 3.15-yard		.07
56 x 60, 3.60-yard		.06
44 x 40, 4.25-yard		.04⅞
Sheetings, 36-inch		
48 x 48, 5.00-yard	yd.	.04⅜/.04½
44 x 40, 6.15-yard		5/16
Tire Fabrics		
Builder		
17¾ ounce 60" 23/11 ply Karded peeler	lb.	.29
Chafer		
14 ounce 60" 20/8 ply Karded peeler	lb.	.29
9¼ ounce 60" 10/2 ply Karded peeler	lb.	.28
Cord Fabrics		
23/5/3 Karded peeler, 1 1/16" cotton	lb.	.30
15/3/3 Karded peeler, 1 1/16" cotton	lb.	.28
23/5/3 Karded peeler, 1¼" cotton	lb.	.35½
23/5/3 Combed Egyptian	lb.	.49
Leno Breaker		
8¼ ounce and 10¼ ounce 60" Karded peeler	lb.	.31

New York Quotations

(*Continued from page 74*)

Clays		
Aerfloted Paragon (50 lb. bags)	ton	$9.50
Suprex (50 lb. bags)	ton	9.50
China	ton	17.50 /$20.00
Dixie	ton	11.00 /30.00
Junior	ton	9.50 /29.00
McNamee	ton	9.50 /22.00
Par	ton	9.50 /22.00
Witco, f.o.b. Works	ton	9.50
Cumar EX	lb.	.035
P-33	lb.	.0475/ .0775
Thermax	lb.	.0175/ .05
Velvetex	lb.	.022 / .035
Reodorants		
Amora A	lb.	
B	lb.	
C	lb.	
D	lb	
Curodex 19	lb.	2.75
188	lb.	3.50
198	lb.	4.50
Rodo No. 0	lb.	3.50 / 4.00
No. 10	lb.	4.50 / 5.00
Rubber Substitutes		
Black	lb.	.07 / .125
Brown	lb.	.08 / .13
White	lb.	.08 / .135
Factice		
Amberex	lb.	.19
Brown	lb.	.07 / .12
Neophax A	lb.	.105
B	lb.	.105
Fac-Cel B	lb.	.15
C	lb.	.15
White	lb.	.08 / .13
Softeners		
Bondogen	lb.	.98 / 1.65
Burgundy pitch	lb.	.06
Cycline oil	gal.	.14 / .20
Nuba resinous pitch (drums)		
Grades No. 1 and No. 2	lb.	.03
Grade No. 3	lb.	.04
Palm oil (Witco), c.l.	lb.	.0575
Pine tar	gal.	
Plastogen	lb.	.0775/ .125
Plastone	lb.	.30 / .35
R-19 Resin (drums)	lb.	.10
R-21 Resin (drums)	lb.	.10
Reogen	lb.	.115 / .30
Rosin oil, compounded	gal.	.40
RPA No. 1	lb.	.65
No. 2	lb.	.65
Rubtack	lb.	.10
Tackol	lb.	.085 / .18
Tonox D	lb.	.75 / .85
Witco No. 20	gal.	$0.20
X-1 Resinous oil (tank car)	lb.	.01
Softeners for Hard Rubber Compounding		
Resin C Pitch 55° C. M.P.	lb.	.013?/$0.014
Resin C Pitch 70° C. M.P.	lb.	.013 / .014
Resin C Pitch 85° C. M.P.	lb.	.013 / .014
Solvents		
Beta-Trichlorethane	gal.	
Carbon bisulphide	lb.	
tetrachloride	lb.	
Industrial 90% benzol (tank car)	gal.	.16
Skellysolve	gal.	
Stabilizers for Cure		
Laurex, ton lots	lb.	.13 / .15
Stearex B	lb.	.105 / .115
Beads	lb.	.09 / .10
Stearic acid, single pressed	lb.	.105 / .115
Stearite	100 lbs.	9.00
Zinc stearate	lb.	.23
Synthetic Rubber		
Neoprene Type E	lb.	.75
G	lb.	.80
H	lb.	.80
M	lb.	.75
Latex Type 50	lb.	.35
55	lb.	.35
56	lb.	.35
"Thiokol" A (f.o.b. Yardville)	lb.	.35
Coating materials	gal.	2.50 / 5.00
DX	lb.	.55
Molding Powder	lb.	.50 / .75
Tackifier		
B. R. H. No. 2	lb.	.015 / .016
Varnish		
Shoe	gal.	1.45
Vulcanizing Ingredients		
Sulphur		
Chloride, drums	lb.	.035 / .04
Rubber	100 lbs.	2.65
Telloy	lb.	1.75 / 2.00
Vandex	lb.	1.75 / 2.00
(See also Colors—Antimony)		
Waxes		
Carnauba, No. 3 chalky	lb.	.37¾
2 N.C.	lb.	.39¾
3 N.C.	lb.	.37¾
1 Yellow	lb.	.4575
2	lb.	.4425
Montan, crude	lb.	.11

FABRICS FOR THE RUBBER INDUSTRY

A plain case of INTESTINAL FABRICITIS

In other words, this belt collapsed under strain because the fabric of its body couldn't stand the gaff. It inherited a weak constitution—its ancestry was unsound. For over 20 years, we have maintained the most unique hospital clinic in America. The patients—thousands of them from all over the world—are broken down belts.

Specialists examine and study every case and from the resulting data at the Belt Hospital, are able to develop a sturdy, rugged line of belt ducks for the rubber industry.

Our Belt Hospital is just one more example of the practical thoroughness of our experience and service. We welcome the opportunity to work with rubber engineers toward the solution of their fabric problems.

WELLINGTON SEARS COMPANY, 65 WORTH ST., NEW YORK

Pacific Coast

(*Continued from page* 53)

forward as soon as possible. The company is continuing operations at the same address, and the stock of automobile and truck tires was not injured.

Ed. Royal, executive of H. M. Royal Co., Los Angeles, Calif., who recently returned from an automobile trip along the Pacific Coast to Victoria, B. C., Canada, reported general business optimism in the Northwest. Mr. Royal, while on his trip, indulged in a two-day salmon fishing outing off Orcas Island in Puget Sound.

New Publications

(*Continued from page* 60)

"Rubber Statistics — 1900 - 1937." United States Department of Commerce, Bureau of Foreign and Domestic Commerce, Washington, D. C. 55 pages. This report, containing 31 tables and six charts, covers the production, absorption, stocks, and prices of crude rubber from the years 1900 to 1937, with the exception of the section on prices, which has been widened to include data prior to 1900. Following a short preliminary statement, annual statistics, 1900 to 1937, and monthly statistics for the last 12 years (or shorter term in some cases) are given. As each table tells its own statistical story, the accompanying textual matter has been made brief. The purpose of this booklet is to afford manufacturers, importers, dealers, etc., a means to make a comparative study of statistics relating to the present period of production and export control and other periods prior to 1934. Copies of the report, priced at 10¢ each, may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C.

"Uniform Rolls with Cameron Constant Web Tension Device." Cameron Machine Co., 61 Poplar St., Brooklyn, N. Y. 4 pages. This pamphlet describes and points out the advantages of the firm's constant web tension device for maintaining uniform tension on the web when unwinding paper or fabric from a roll. With this device, which is entirely mechanical in operation, tension control is maintained by a counter-weighted floating roller over which the web passes.

"Flexible Couplings." Poole Foundry & Machine Co., Baltimore, Md. 70 pages. This catalog (No. 38) describes the complete line of Poole flexible couplings for use on direct connected machinery to compensate for errors or changes in the alinement of connecting shafts and to provide for free lateral float. Data, tables, and engineering information pertaining to flexible couplings with illustrations pointing out their diversity of application are included in the booklet.

British Malaya

An official cable from Singapore to the Malayan Information Agency, Malaya House, 57 Trafalgar Sq., London, W.C.2, England, gives the following figures for June, 1938:

Rubber Exports: Ocean Shipments from Singapore, Penang, Malacca, and Port Swettenham

To	Sheet and Crepe Rubber Tons	Latex, Concentrated Latex, Revertex, and Other Forms of Latex Tons
United Kingdom	9,013	391
United States	15,421	290
Continent of Europe	10,089	400
British possessions	2,886	48
Japan	2,692	34
Other countries	988	6
Totals	41,089	1,169

Rubber Imports: Actual, by Land and Sea

From	Dry Rubber Tons	Wet Rubber (Dry Weight) Tons
Sumatra	5,844	370
Dutch Borneo	1,382	4
Java and other Dutch Islands	145	..
Sarawak	2,118	5
British Borneo	264	8
Burma	389	11
Siam	2,642	647
French Indo-China	324	120
Other countries	116	5
Totals	13,224	1,170

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(*Continued from page* 60)

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INTERNATIONAL ROAD CONGRESS, *India Rubber J.*, July 16, 1938, pp. 17-18.

New Bakelite Polystyrene

A new Bakelite polystyrene, known as XMS-10023, recently was announced. Among other qualifications the following are claimed for this molding material.

1. It has a specific gravity of 1.07.

2. Tests indicate that parts of the ordinary type will withstand temperatures up to 176° F. without distortion when the load involved is simply its own weight.

3. Its dielectric strength is more than 500 volts per mil; its resistivity 10^8 megohm-centimeters; and its arc resistance 240-250 seconds (proposed A.S.T.M. method). Water absorption of XMS-10023 is only 0.05% on a 2½-inch disk, after 318 hours' total immersion.

4. It is unaffected by ordinary concentrations of both acids and alkalies.

5. It is more resistant to shock than inorganic insulators which have comparable electrical properties. Its tensile and flexural strength are also above that observed in inorganic substances.

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De Vilbiss Co.	7% Pfd.	0.17½ q.	July 15	June 30
Dunlop Tire & Rubber Goods Co., Ltd.	5% 1st Pfd.	$0.62½ initial s.	June 30	June 30
Fisk Rubber Co.	Pfd.	$1.50 q.	July 20	July 11
Goodyear Tire & Rubber Co.	Pfd.	$1.25 q.	Sept. 15	Aug. 15
Lee Rubber & Tire Corp.	Com.	$0.25	Aug. 1	July 15
Okonite Co.	Com.	$1.00 reduced	Aug. 1	July 15
Pharis Tire & Rubber Co.	Com.	$0.15 q.	Aug. 20	Aug. 5
Philadelphia Insulated Wire Co.	Com.	$0.25 reduced s.	Aug. 1	July 15
S. S. White Dental Mfg. Co.	Com.	$0.15 reduced	Aug. 15	July 30

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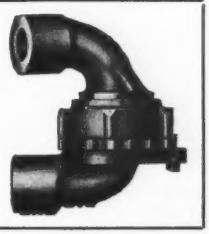

(*Advertisements continued on page* 81)

U. S. Crude and Waste Rubber Imports for 1938

	Planta-tions	Latex	Paras	Afri-cans	Cen-trals	Guay-ule	Totals 1938	Totals 1937	Balata	Miscel-laneous	Waste
Jan. .....*tons*	39,744	1,259	411	177	6	538	42,135	32,820	41	526	8
Feb.	41,709	1,400	453	150	..	218	43,930	43,289	35	808	22
Mar.	34,252	861	371	278	..	205	35,967	52,039	37	555	93
Apr.	29,662	690	324	...	1	130	30,807	35,850	73	1,046	33
May	25,967	696	195	326	1	225	27,410	50,840	32	647	5
June	25,141	640	20	60	..	150	26,011	48,956	35	901	23
Total 6 mos., 1938.....*tons*	196,475	5,546	1,774	991	8	1,466	206,260	.....	253	4,483	184
Total 6 mos., 1937.....*tons*	246,390	11,558	4,291	424	77	1,054	.....	263,794	168	4,170	2,331

Compiled from The Rubber Manufacturers Association, Inc., statistics.

United States Latex Imports

Year	Lbs. Solids	Value
1936	44,469,504	$6,659,899
1937	51,934,040	10,213,670
1938		
Jan.	3,135,524	494,242
Feb.	3,772,897	560,883
Mar.	2,192,459	327,844
Apr.	1,991,943	295,690
May	1,968,576	279,502
June	1,556,507	214,420

Data from Leather and Rubber Division, United States Department of Commerce, Washington,

World Net Imports of Crude Rubber

Year	U.S.A.	U.K.†	Australia	Belgium	Canada	Czecho-slovakia	France	Germany	Italy	Japan	Russia	Rest of the World	Total
1936	475,500	62,700	14,400	9,600	27,900	8,800	56,800	71,800	16,000	61,700	31,000	64,600	831,300
1937	592,528	137,351	19,257	14,969	36,087	13,063	59,959	98,170	23,980	62,205	30,462	67,745	1,110,856
1938													
Jan.	45,596	17,811	617	1,258	1,789	1,102	4,780	6,314	1,809	4,935	693	5,292	89,643
Feb.	40,977	19,149	621	974	615	1,771	5,420	6,959	2,000	3,173	2,341	5,432	86,788
Mar.	42,075	18,134	1,084	961	2,123	1,323	4,823	10,768	1,365	6,222	2,162	5,486	94,304
Apr.	31,870	16,572	647	904	999	920	5,721	6,497	2,397	5,456	2,000*	5,545	77,609

*Estimated. †U. K. figures show gross imports, not net imports. Source: *Statistical Bulletin of the International Rubber Regulation Committee.*

Shipments of Crude Rubber from Producing Countries

Year	Malaya including Brunei and Labuan	N.E.I.	Ceylon	India	Burma	North Borneo	Sarawak	Siam	French Indo-China	Philippines Total	Philippines and Oceania	Africa	South America	Mexican Guayule	Grand Total
1936	353,700	309,600	49,700	8,600	5,800	8,200	21,000	34,600	40,800	832,000	1,600*	6,100	14,700	1,200	855,600
1937	469,960	431,646	70,359	9,777	7,232	13,213	25,922	35,551	43,374	1,107,034	1,617*	7,678	16,008	2,692	1,135,029
1938															
Jan.	30,998	26,468	5,222	841	538	1,307	3,485	2,897	6,088	77,844	138	824	938	538	80,282
Feb.	37,166	27,366	5,216	639	770	918	8	3,266	3,070	78,419	125	641	1,640	218	81,043
Mar.	33,567	31,268	3,834	532	703	853	1,564	2,837	3,213	78,371	159	968	1,883	150	81,531
Apr.	44,744	28,482	1,951	485	842	1,158	1,728	1,583	3,647	84,620	201	318	1,085	188	86,412
May	28,011	22,030	2,825	916	561	815	1,648	2,507	3,118	62,431	150*	600*	1,160	200*	64,541

*Estimated. Source: *Statistical Bulletin of the International Rubber Regulation Committee.*

Rims Approved by The Tire & Rim Association, Inc.

Rim Size	6 Mos., 1938 No.	%	6 Mos.,1937 No.	%
Drop Center Rims, 16″ Diameter and Under				
16x4.00D	6,075	0.1	9,170	0.1
16x4.25D	.....	...	239,856	1.9
16x4.50D	5,957	0.1	931	0.0
15x3.00D	35,344	0.9	.....	...
15x3.50D	46	0.0	.....	...
15x5.50F	43,765	1.1	144,213	1.1
16x3.50D	159,949	3.9	1,232,121	9.5
16x4.00E	1,761,061	43.3	5,229,183	40.5
16x4.25E	69,723	1.7	672,691	5.2
16x4.50E	517,407	12.5	2,069,762	16.3
16x5.00F	260,981	6.4	608,133	4.7
16x5.50F	58,728	1.4	88,319	0.7
16x6.00F	14,963	0.4	12,732	0.1
Semi Drop Center Rims, 16″ Diameter				
16x4.50E	7,223	0.2	.....	...
16x5.50F	20,506	0.5	.....	...
Drop Center Rims, 17″ Diameter and Over				
17x3.00D	719	0.0	5,785	0.0
17x3.25E	3,164	0.1	28,601	0.2
17x3.62F	.....	...	32,748	0.3
17x4.00F	.....	...	356	0.0
17x4.19F	.....	...	959	0.0
17x5.00F	167	0.0	3,650	0.0
18x2.15B	10,626	0.2	8,282	0.1
18x3.00D	1,187	0.0	1,717	0.0
18x3.25E	1,782	0.0	8,204	0.1
18x3.62F	7,076	0.2	31,475	0.2
18x4.00F	.....	...	4,760	0.0
18x4.19F	4,879	0.1	20,118	0.2
19x2.15B	.....	...	1,405	0.0
19x3.00D	.....	...	2,703	0.0
19x3.25E	248	0.0	350	0.0
19x3.62F	.....	...	3,383	0.0
20x3.25E	2,191	0.1	5,208	0.0
20x3.62F	1,774	0.0	.....	...
21x3.00D	962	0.0	.....	...
21x3.25E	3,108	0.1	11,208	0.1
Flat Base Rims for Balloon Tires				
All Sizes.....	3,304	0.1	13,865	0.1

Rim Size	6 Mos., 1938 No	%	6 Mos.,1937 No.	%
Flat Base Rims for High Pressure Tires				
All Sizes.....	232	0.0	352	0.0
Clincher Rims				
All Sizes.....	.....	...	1,838	0.0
15″ Truck Rims				
15x7	2,224	0.1	2,331	0.0
15x8	1,628	0.0	1,087	0.0
17″ Truck Rims				
17x5	44,195	1.1	.....	...
17x6	21,296	0.5	16,859	0.1
18″ Truck Rims				
18x5	59	0.0	.....	...
18x6	48	0.0	5,151	0.0
18x7	10,242	0.2	28,569	0.2
18x8	8,143	0.2	4,328	0.0
18x9/10	1,328	0.0	3,454	0.0
20″ Truck Rims				
20x5	143,917	3.5	635,635	4.9
20x6	374,752	9.2	1,004,766	7.8
20x7	111,201	2.9	277,856	2.1
20x8	29,983	0.7	106,511	0.8
20x9/10	8,902	0.2	19,279	0.2
20x11	2,102	0.1	1,532	0.0
22″ Truck Rims				
22x7	130	0.0	61	0.0
22x8	4,295	0.1	12,874	0.1
22x9/10	833	0.0	3,003	0.0
24″ Truck Rims				
24x6	946	0.0	1,815	0.0
24x7	1,555	0.0	4,608	0.0
24x8	3,224	0.1	9,611	0.1
24x9/10	3,852	0.1	9,204	0.1
24x11	1,882	0.0	1,919	0.0
Tractor and Implement Rims				
12x3.00D	3,452	0.1	3,158	0.0
15x3.00D	35,605	0.9	53,831	0.4
16x3.00D	1,147	0.0	.....	...

Rim Size	6 Mos., 1938 No.	%	6 Mos.,1937 No.	%
16x6.00F	8,996	0.2	.....	...
18x3.00D	910	0.0	.....	...
18x5.50F	9,276	0.2	4,914	0.0
20x4.50E	2,128	0.0	7,764	0.1
20x5.00F	2,262	0.1	.....	...
20x5.50F	7,673	0.2	2,419	0.0
21x3.00D	675	0.0	881	0.0
22x4.50E	1,600	0.0	1,336	0.0
24x3.00D	13	0.0	.....	...
28x4.00D	44	0.0	.....	...
36x3.00D	852	0.0	934	0.0
36x4.50E	358	0.0	568	0.0
40x3.00D	61	0.0	.....	...
40x5.50F	27	0.0	.....	...
44x4.00E	5	0.0	.....	...
24x5.50R	18,438	0.4	.....	...
32x5.50R	163	0.0	.....	...
36x5.50R	1,914	0.0	.....	...
40x5.50R	6,275	0.1	.....	...
20x8.00T	507	0.0	.....	...
24x6.00S	2,975	0.1	15,123	0.1
24x8.00T	46,414	1.1	42,555	0.3
28x6.00S	1,160	0.0	2,302	0.0
28x8.00T	24,963	0.6	41,721	0.3
32x8.00T	6,099	0.1	5,881	0.0
36x6.00S	32,362	0.8	39,427	0.3
36x8.00T	48,623	1.2	29,204	0.2
40x6.00S	15,592	0.4	11,860	0.1
40x8.00T	447	0.0	.....	...
42x8.00T	510	0.0	416	0.0
44x8.00T	91	0.0	190	0.0
Cast Wheels				
10x5.00F	1,275	0.0	2,023	0.0
10x6.00F	174	0.0	726	0.0
15x2.50D	.....	...	166	0.0
24x15	173	0.0	279	0.0
Airplane Rims				
All Sizes	261	0.0	982	0.0
Totals	4,063,384		12,913,191	

Classified Advertisements

Continued

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CONSOLIDATED OFFERS: 1-6" ALLEN TUBER, motor driven; 2-Birmingham 22"x20"x60" Mills; 3-42" Thropp Mills, motor driven; 6-30" x30" Hydraulic Presses with 16" rams; 4-24"x24" Hydraulic Presses with 18" rams. We Buy and Sell from a Single Item to a Complete Plant. **CONSOLIDATED PRODUCTS CO., INC., 13-16 Park Row, New York, N. Y.**

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United States Statistics

Imports for Consumption of Crude and Manufactured Rubber

	April, 1938		Four Months Ended April, 1938	
UNMANUFACTURED—*Free*	Quantity	Value	Quantity	Value
Liquid latex (solids)....*lb.*	1,991,943	$295,690	11,092,823	$1,678,659
Jelutong or pontianak....*lb.*	2,833,514	444,756	7,484,756	1,263,550
Balata ....*lb.*	148,025	25,741	427,059	65,546
Gutta percha ....*lb.*	8,282	3,933	313,815	52,121
Guayule ....*lb.*	420,654	50,423	2,450,054	299,723
Siak ....*lb.*	36,925	4,322	82,325	9,501
Scrap and reclaimed....*lb.*	459,214	6,816	1,519,277	24,028
Totals	5,898,557	$831,681	23,370,109	$3,393,128
Misc. rubber (above), 1,000 *lbs.*	5,898	$831,681	23,370	$3,393,128
Crude rubber....1,000 *lbs.*	69,535	9,495,476	349,436	51,201,291
Totals ....1,000 *lbs.*	75,433	$10,327,157	372,806	$54,594,419
Chicle, crude ....*lb.*	1,387,419	$471,698	4,805,397	$1,522,482
MANUFACTURED—*Dutiable*				
Rubber tires ....*no.*	1,785	$2,727	5,507	$19,595
Rubber boots, shoes, and overshoes ....*prs.*	7,588	1,466	21,765	3,666
Rubber soled footwear with fabric uppers ....*prs.*	80,227	15,413	253,395	62,553
Golf balls ....*no.*	73,159	8,189	293,251	26,859
Lawn tennis balls....*no.*	74,835	7,696	303,748	28,302
Other rubber balls....*no.*	497,053	7,061	1,357,638	50,355
Other rubber toys ....*lb.*	20,631	2,327	146,742	22,220
Hard rubber combs ....*no.*	22,788	1,641	152,280	10,165
Other manufactures of hard rubber	.....	1,304	.....	5,975
Friction or insulating tape *lb.*	2,900	169	39,475	2,190
Belts, hose, packing, and insulating material	.....	4,982	.....	27,547
Druggists' sundries of soft rubber	.....	4,788	.....	26,195
Inflatable swimming belts, floats, etc. ....*no.*	96,864	7,547	282,807	22,232
Other rubber and gutta percha manufactures....*lb.*	65,050	17,317	334,736	79,196
Totals	.....	$82,627	.....	$387,050

Exports of Foreign Merchandise

RUBBER AND MANUFACTURES				
Crude rubber ....*lb.*	559,166	$75,797	3,417,168	$502,932
Balata ....*lb.*	37,503	11,580	120,853	37,597
Other rubber, rubber substitutes and scrap....*lb.*	.....	.....	282,646	35,537
Rubber manufactures (including toys)	.....	1,809	.....	5,463
Totals	.....	$89,186	.....	$581,529

Exports of Domestic Merchandise

RUBBER AND MANUFACTURES				
Reclaimed ....*lb.*	953,168	$38,010	4,502,649	$265,996
Scrap ....*lb.*	6,494,719	93,625	21,246,633	342,915
Cements ....*gal.*	71,885	66,330	151,978	136,714
Rubberized automobile cloth, *sq. yd.*	42,934	19,930	124,865	55,906
Other rubberized piece goods and hospital sheeting..*sq. yd.*	199,789	79,511	801,619	319,284
Boots ....*prs.*	7,753	16,212	41,664	90,285
Shoes ....*prs.*	33,635	13,449	104,774	48,780
Canvas shoes with rubber soles ....*prs.*	64,996	42,804	172,249	114,442
Heels ....*doz. prs.*	48,550	26,542	148,000	75,096
Soling and top lift sheets.*lb.*	40,706	7,477	113,516	21,299
Gloves and mittens..*doz. prs.*	9,426	18,722	33,586	68,257
Water bottles and fountain syringes ....*no.*	23,473	7,512	73,689	23,924
Other druggists' sundries...	.....	53,782	.....	184,592
Gum rubber clothing....*doz.*	21,776	54,247	86,844	194,116
Balloons ....*gross*	45,882	28,702	146,917	97,740
Toys and balls....	.....	9,087	.....	36,839
Bathing caps ....*doz.*	6,122	13,014	19,558	41,045
Bands ....*lb.*	22,267	8,841	87,780	35,003
Erasers ....*lb.*	23,241	12,941	106,344	60,455
Hard rubber goods				
Electrical battery boxes.*no.*	22,770	15,299	81,882	55,860
Other electrical ....*lb.*	26,846	5,092	148,503	31,862
Combs, finished....*doz.*	11,462	8,449	80,765	31,475
Other hard rubber goods..	.....	17,056	.....	69,514
Tires				
Truck and bus casings..*no.*	23,552	477,553	78,831	1,560,623
Other automobile casings, *no.*	59,954	585,570	207,387	2,037,766
Tubes, auto ....*no.*	49,387	88,088	187,798	298,612
Other casings and tubes.*no.*	7,817	58,739	25,293	210,504
Solid tires for automobiles and motor trucks....*no.*	413	11,489	1,248	34,391
Other solid tires....*lb.*	111,428	20,680	254,391	45,229
Tire sundries and repair materials	.....	61,975	.....	238,902
Rubber and friction tape..*lb.*	52,527	17,371	241,928	68,915
Fan belts for automobiles.*lb.*	45,279	21,998	158,206	81,952
Other rubber and balata belts ....*lb.*	245,361	128,730	960,352	493,667
Garden hose ....*lb.*	59,353	11,107	213,364	41,545
Other hose and tubing....*lb.*	441,278	157,040	1,500,219	549,425
Packing ....*lb.*	92,166	47,490	359,673	177,489
Mats, matting, flooring, and tiling ....*lb.*	75,113	11,071	296,297	46,459
Thread ....*lb.*	50,788	31,028	135,173	94,694
Gutta percha manufactures.*lb.*	86,632	27,340	255,944	80,408
Other rubber manufactures..	.....	113,020	.....	413,502
Totals	.....	$2,546,923	.....	$8,875,482

Rubber Goods Production Statistics

TIRES AND TUBES		1938 Apr.	1937 Apr.
Pneumatic casings:			
Production	*thousands*	2,706	5,730
Shipments, total	*thousands*	3,199	5,560
Domestic	*thousands*	*	5,438
Stocks, end of month	*thousands*	10,317	12,629
Inner Tubes:			
Production	*thousands*	2,142	5,627
Shipments, total	*thousands*	2,704	5,325
Domestic	*thousands*	*	5,242
Stocks, end of month	*thousands*	9,525	12,218
Raw material consumed:			
Fabrics	*thous. of lbs.*	....	24,680
MISCELLANEOUS PRODUCTS			
Single and double texture proofed fabrics:			
Production	*thous. of yds.*	2,461	4,626
Rubber and canvas footwear:			
Production, total	*thous. of prs.*	3,566	7,197
Tennis	*thous. of prs.*	*	4,053
Waterproof	*thous. of prs.*	*	3,144
Shipments, total	*thous. of prs.*	3,837	5,027
Tennis	*thous. of prs.*	*	3,784
Waterproof	*thous. of prs.*	*	1,243
Shipments, domestic, total	*thous. of prs.*	*	5,027
Tennis	*thous. of prs.*	*	3,784
Waterproof	*thous. of prs.*	*	1,243
Stocks, total, end of month	*thous. of prs.*	20,400	19,167
Tennis	*thous. of prs.*	*	5,213
Waterproof	*thous. of prs.*	*	13,954

*Data no longer available.

The above figures have been adjusted to represent 100% of the industry based on reports received which represented 81% for 1936-37.

Source: *Survey of Current Business*, Bureau of Foreign & Domestic Commerce, Washington, D. C.

Foreign Trade Information

For further information concerning the inquiries listed below address United States Department of Commerce, Bureau of Foreign and Domestic Commerce, Room 734, Custom House, New York, N. Y.

No.	COMMODITY	CITY AND COUNTRY
*6817	Automobile accessories and equipment..	Toronto, Canada
*6818	Carbon black	Singapore, Straits Settlements
*6825	Electrical insulating materials and packings	Stockholm, Sweden
†6826	Storage batteries	Singapore, Straits Settlements
*6829	Druggists' sundries	Tel-Aviv, Palestine
†6849	Scrap rubber	London, England
‡6851	Asbestos, rubberized in sheets....	Prague, Czechoslavakia
*6854	Druggists' sundries	Lima, Peru
*6856	Soles and heels and composition inner and outer soling	Paris, France
*6877	General merchandise for 5 and 10¢ stores, and toys	San Juan, Puerto Rico
†6880	Rubber buttons	Birmingham, England
†6885	Advertising novelties	Calcutta, India
†6905	Tires and tubes	Nairobi, East Africa
†6914	Household novelties	Baghdad, Iraq
†6935	Rubber boots	Scutari, Albania
*6953	Sporting goods and toilet articles....	Buenos Aires, Argentina
†6964	Desk blotting pad holders, rubber construction	Brisbane, Australia
†6981	Brassieres, girdles, and corsets....	Olomouc, Czechoslovakia
‡6984	Toy novelties	Toronto, Canada
*7036	Druggists' sundries and rubber cloth..	Habana, Cuba
*7044	Rubberized cloth and clothing, and other rubber goods	London, England
*7050	Suspenders and garters....	Amsterdam, Netherlands
*7055	Rubber-coated cloth	Istanbul, Turkey
*7064	Automobile accessories and parts....	Brussels, Belgium
‡7080	Household novelties	Brussels, Belgium
*7097	Rubberized cloth	Rio de Janeiro, Brazil
†7107	Toys	Maastricht, Netherlands
*7112	Corsets	Guatemala City, Guatemala

*Agency. †Purchase. ‡Purchase and agency.

Imports by Customs Districts

	May, 1938 *Crude Rubber Pounds	May, 1938 *Crude Rubber Value	May, 1937 *Crude Rubber Pounds	May, 1937 *Crude Rubber Value
Massachusetts	4,329,080	$618,562	11,684,221	$2,532,207
New York	38,981,891	5,046,174	82,979,027	17,461,616
Philadelphia	1,787,024	215,639	1,410,668	258,445
Maryland	2,369,797	250,083	1,437,746	303,658
New Orleans	9,954,456	1,359,268	386,529	79,342
Galveston	123,200	16,779	.....	.....
Los Angeles	4,813,634	695,649	11,460,820	2,402,793
San Francisco	755,273	100,447	454,215	92,425
Oregon	40,320	6,044	22,400	4,480
Michigan	.....	.....	2,309	552
Ohio	96,355	11,864	99,180	19,250
Colorado	224,000	30,999	.....	.....
Totals	63,475,030	$8,351,508	109,937,115	$23,154,768

*Crude rubber including latex dry rubber content.

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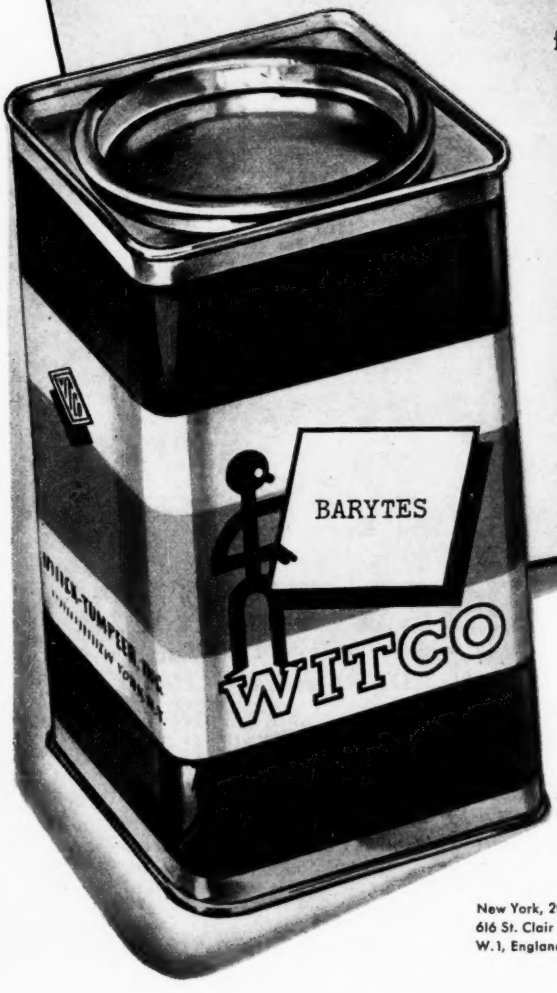

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- **CARBON BLACK**
- **HYDRO CARBON**
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BUY DIRECT AND PROFIT DIRECTLY

IT'S RESULTS THAT COUNT

★A MANUFACTURER OF A NEW DECALCOMANIA PROCESS for placing colored designs on rubber took *one* advertisement in INDIA RUBBER WORLD and got over 70 replies from leading concerns representing nearly 25% of his possible market.

★A MANUFACTURER OF A SPECIAL TYPE OF STEEL ROLLS—from one advertisement in INDIA RUBBER WORLD—received over fifteen inquiries from rubber manufacturers he had *never contacted.*

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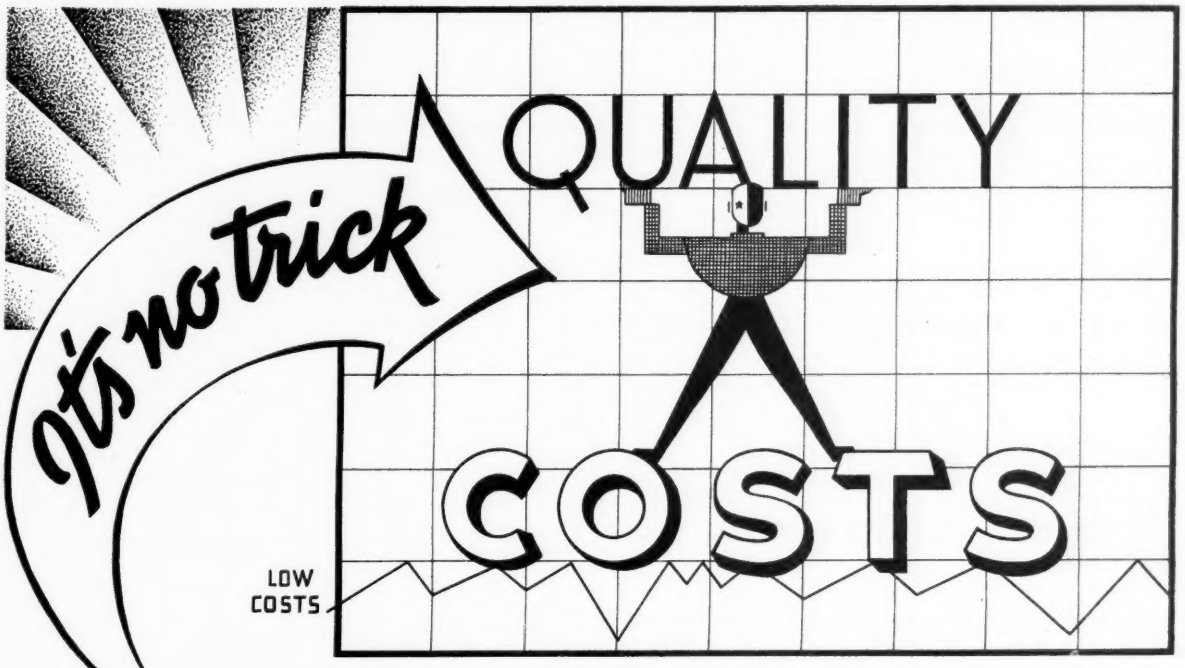

to keep the quality of your rubber products at the same high level!

Switching back and forth from crude to reclaims as the price of rubber fluctuates keeps changing the quality of your finished product. By using NAUGATUCK RECLAIMS you can be assured of the uniformity of your product.

NAUGATUCK RECLAIMS are made by up-to-date methods with modern equipment by one of the oldest and most reliable reclaimers. They are checked for quality, uniformity, and processing ability by thoroughly reliable laboratory technicians.

NAUGATUCK provides technical data and assistance.

Keep quality UP and costs DOWN with NAUGATUCK RECLAIMS.

Naugatuck Chemical

DIVISION OF UNITED STATES RUBBER PRODUCTS, INC.

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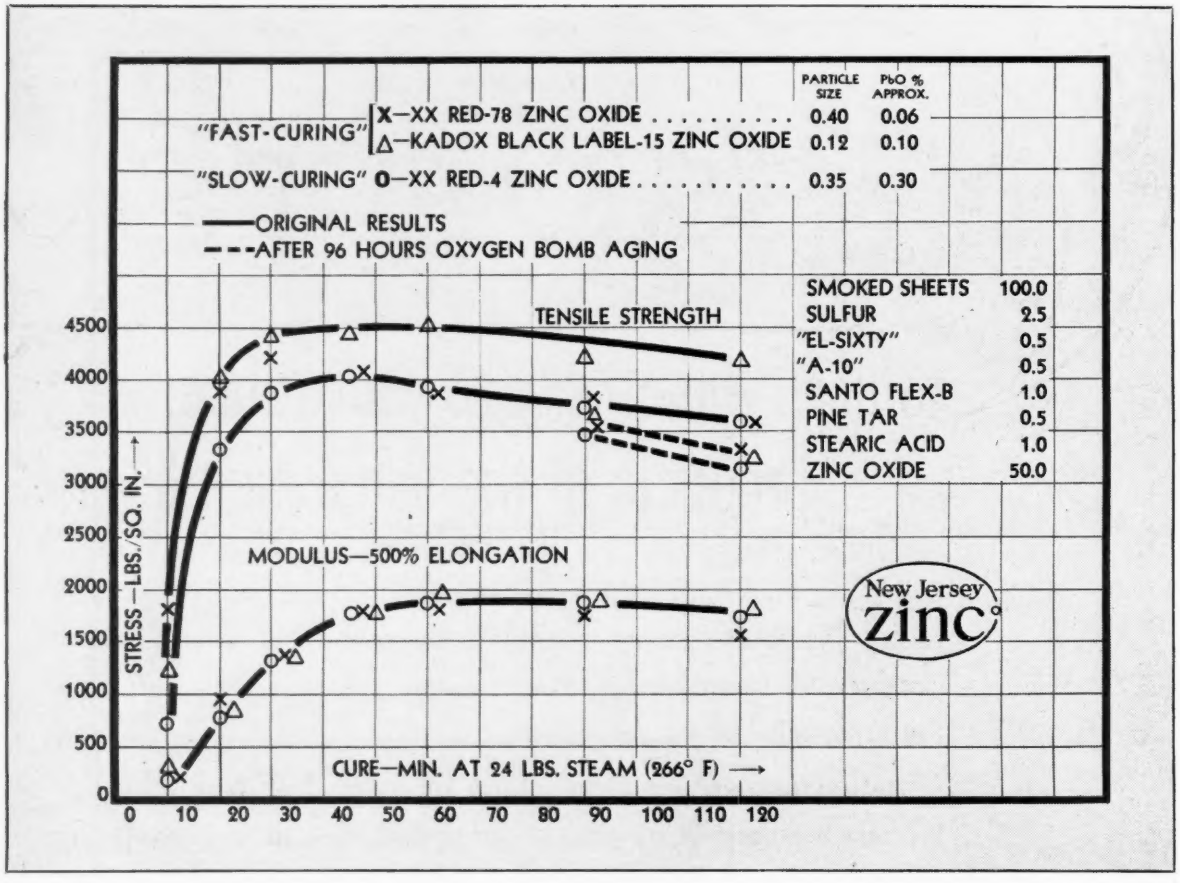
"Fast-" and "Slow-Curing" Zinc Oxides with "EL-SIXTY" and "A-10"

No. 62 of a series of charts showing a comparison of "FAST-" and "SLOW-CURING" zinc oxides with typical accelerators.


PARTICLE SIZE
PbO % APPROX.
"FAST-CURING" X—XX RED-78 ZINC OXIDE 0.40 0.06
Δ—KADOX BLACK LABEL-15 ZINC OXIDE 0.12 0.10
"SLOW-CURING" O—XX RED-4 ZINC OXIDE 0.35 0.30
—ORIGINAL RESULTS
- - -AFTER 96 HOURS OXYGEN BOMB AGING
TENSILE STRENGTH
MODULUS—500% ELONGATION
SMOKED SHEETS 100.0
SULFUR 2.5
"EL-SIXTY" 0.5
"A-10" 0.5
SANTO FLEX-B 1.0
PINE TAR 0.5
STEARIC ACID 1.0
ZINC OXIDE 50.0
STRESS—LBS./SQ. IN.
CURE—MIN. AT 24 LBS. STEAM (266° F)
New Jersey zinc

Horse Head XX Red-4 retards "El-Sixty" and "A-10" in a 9 volume loading indicating scorch inhibiting properties. "Fast-curing **XX Red-78** and **Kadox Black Label-15** give somewhat higher original results, but the advantages are lost after 96 hours of oxygen bomb aging.

UNIFORM QUALITY ZINC OXIDES

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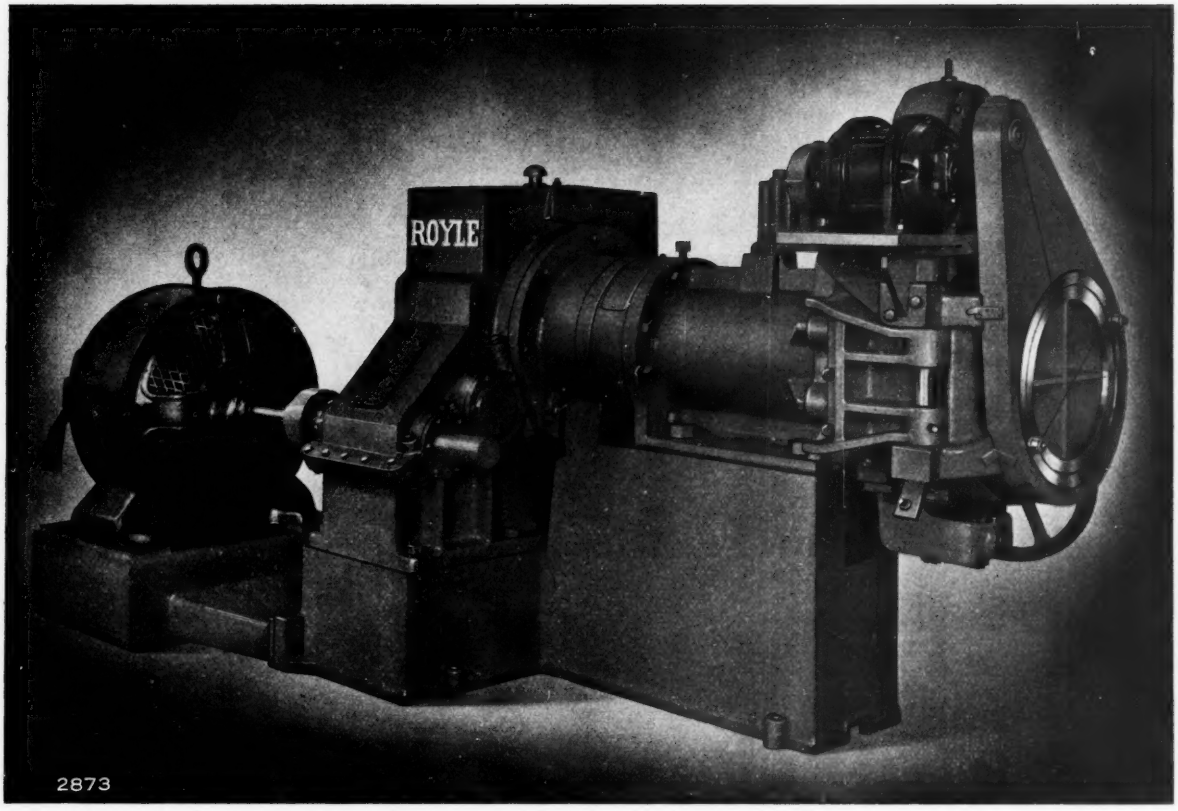

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ROYLE STRAINERS

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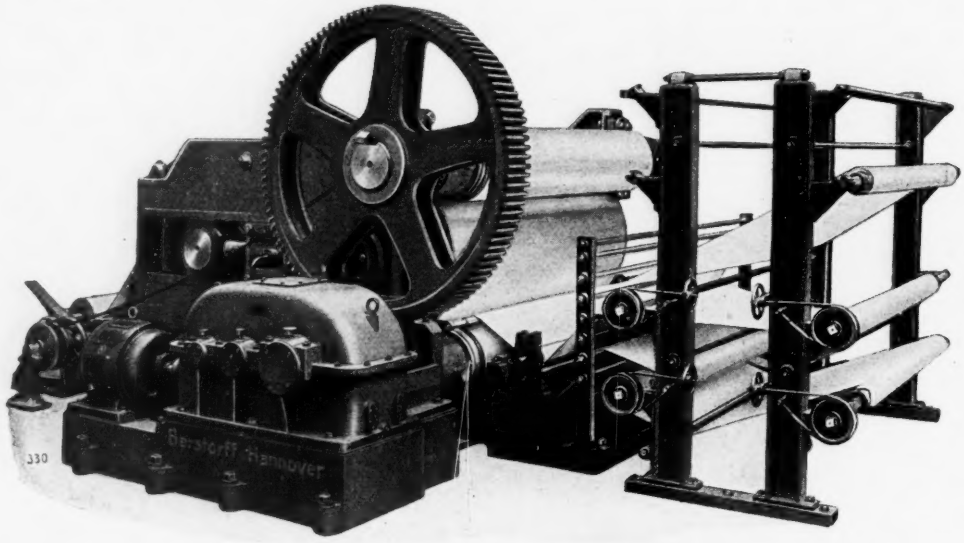
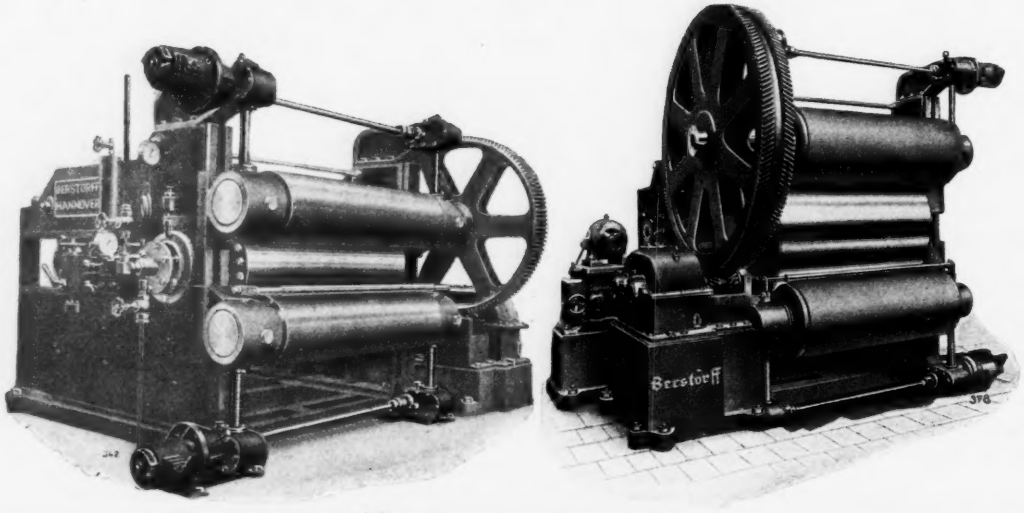
of uniformly highest quality,

while giving considerably greater production for the same capital outlay and floor space as compared with the older methods.





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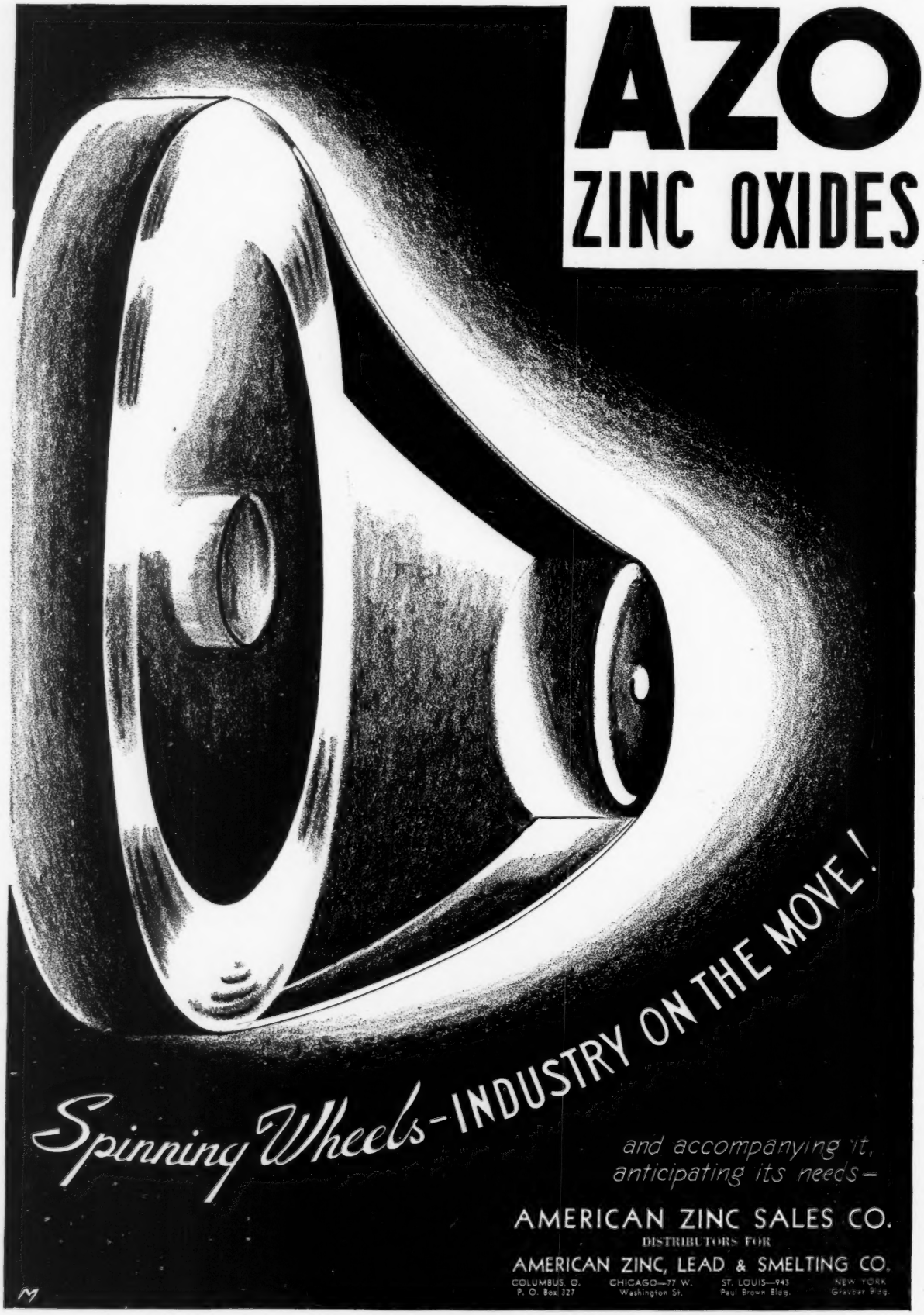
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How Alert Rubber Chemists Are Helping Their Sales Forces *Sell The Shoe Trade!*

by A. ERNEST MACGEE

Manager Skellysolve Division, Skelly Oil Company

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One thing I've learned, in working with chemists responsible for the quality of rubber cements, is how progressive they are, how quickly they utilize each advance in materials to improve their products—and help their sales forces make more sales.

Recently I've watched a number of chemists test Skellysolve, and take advantage of its special qualities to make cements ideally fitted for the shoe trade.

Because Skellysolve is free from greasy residues, they used it to make complete drying cements, higher in strength than cements made with ordinary naphthas. Because Skellysolve's boiling ranges are close, and evaporation rates rapid and even, they used it to make quick-setting cements with drying times made to order. Because of the essentially pure saturated-type compounds in Skellysolve, and freedom from contaminations, their cements were better odored, with little tendency to thin out or to gel.

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So if you use benzol, rubber solvent gasoline, toluol, ether, carbon tetrachloride or other solvents in fabricating operations or in making rubber cements, why not check properties and prices with Skellysolve? I'm sure it will pay you.

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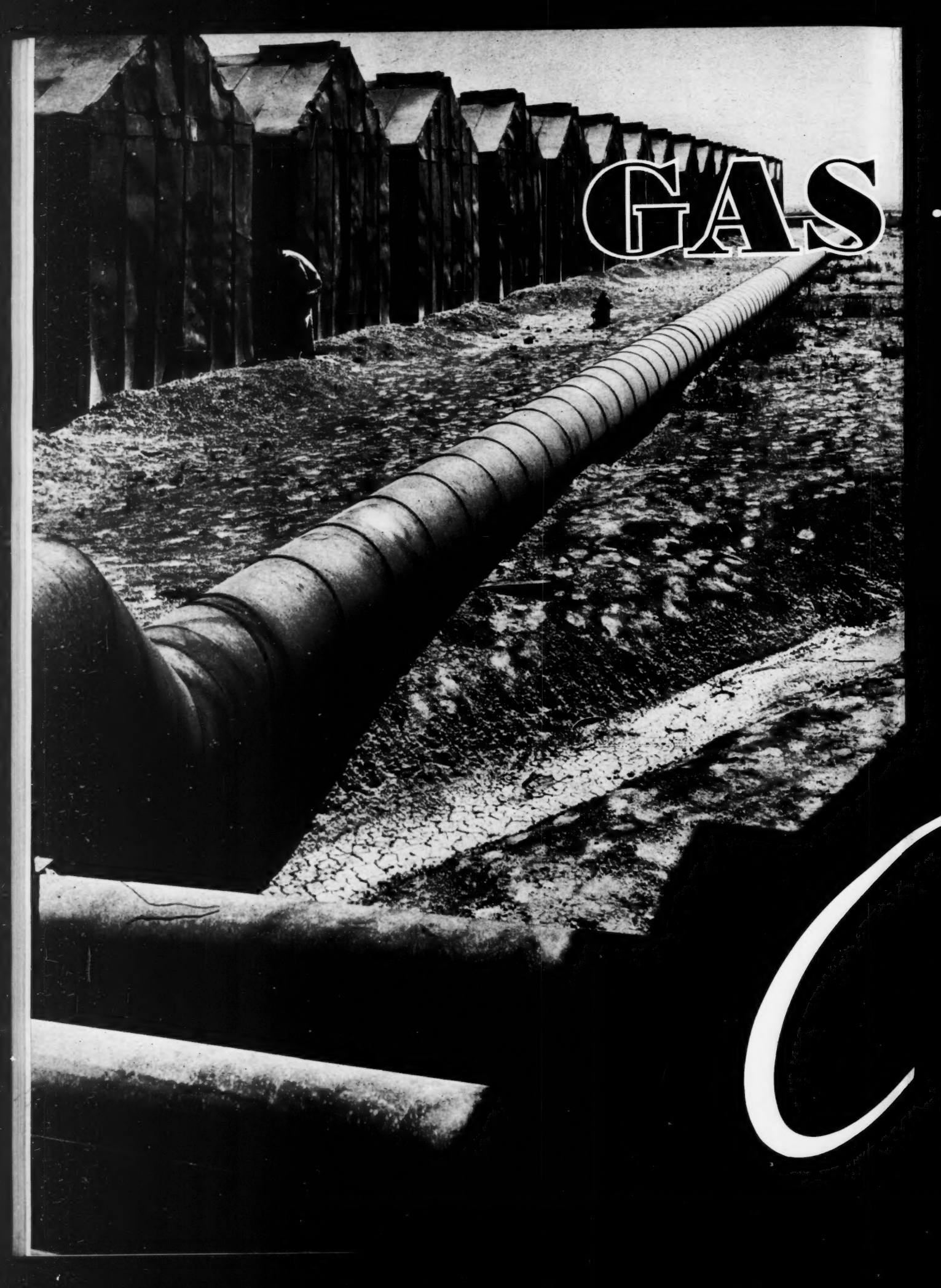
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. . . FOR HOUSES OF FLAME

There are 366 burner houses, such as these shown here, in Continental's carbon black plant at Sunray, Texas. In each, hundreds of flames are burning day and night, producing carbon black for the growing needs of industry. These houses are under the constant observation of men patrolling up and down the line. The man in this picture is inspecting the appearance of the flames in one of them. Gas is supplied through the big pipe which circles the entire plant in a huge loop. This assures a more uniform distribution of gas to all houses—just one of the many factors that contribute to the uniformity of Continental Carbon Black, and to the confidence with which it may be used in your formulas.

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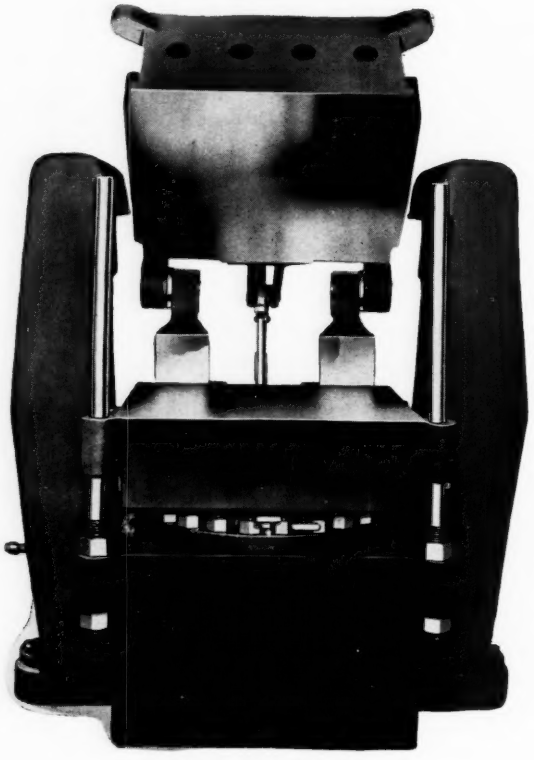

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A PRESS OF *PROVEN* PERFORMANCE
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UNITS ARE BUILT IN VARIOUS SIZES
TO MEET SPECIAL REQUIREMENTS

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RESEARCH HELPS KEEP WORK-WHISTLES BLOWING

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Today chemicals play a vital part in the development of new and better rubber compounding techniques and the perfection of more efficient methods of production. As they grow in importance, the need of cooperation from the chemical manufacturer grows also. Cyanamid has established a research, technical and delivery service that meets the demands of the industry. It is a progressive service that keeps abreast of changing demands. All your needs of today—for both quantity and variety—can be met with prompt delivery from our plants and warehouses, while your needs for tomorrow are being anticipated with extensive research.

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*Registered U. S. Patent Office.

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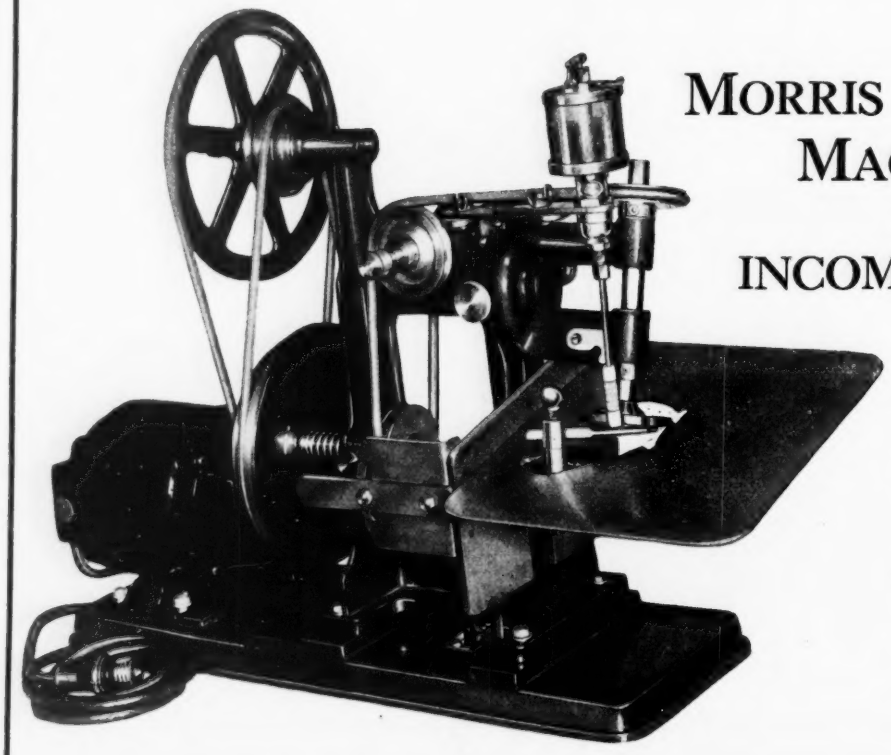

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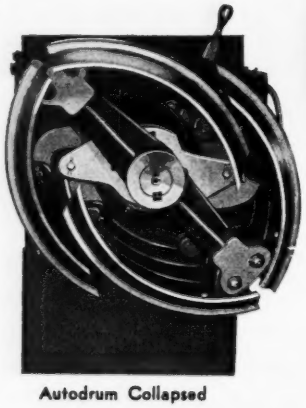
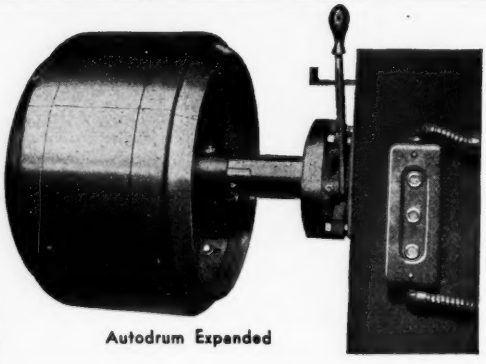


Autodrum Collapsed



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As usual our AUTODRUMS have made good on all these sizes and for Truck Tires, Tractor Tires and Airplane Tires, too!! They are the most economical, efficient drums on the market today.

Check up now, and if you are not adequately equipped with these size AUTO-DRUMS, mail your order at once.

The Akron Standard Mold Co.

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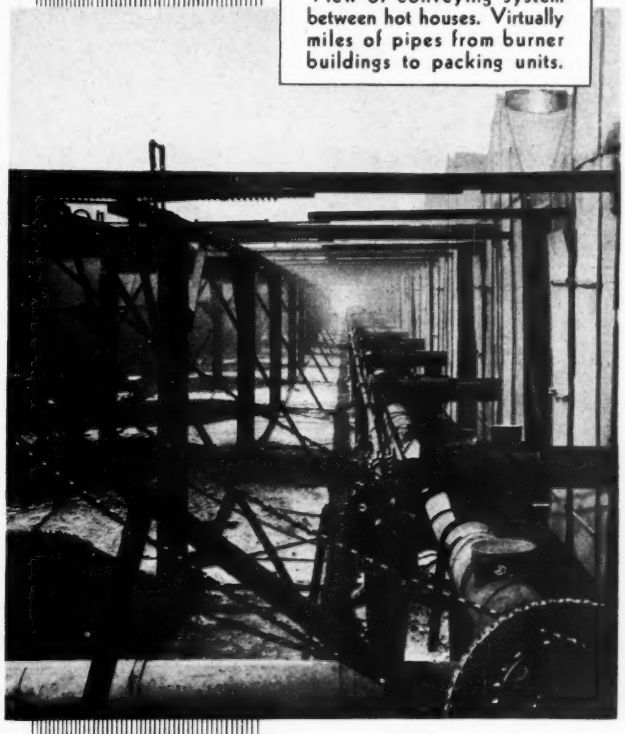
SUPREME a better black from which to formulate
Rubber Products that'll give you pride
And keep your customers satisfied.

For grit-free quality
we always strive;
That is the subject of
POINT No. 5

View of conveying system between hot houses. Virtually miles of pipes from burner buildings to packing units.



THE presence of particles of hard carbon and foreign material in Carbon Black can cause premature local failure in many Rubber products, as for example solid Tires or Engine Mountings. All possible sources of contamination by grit have been eliminated in our plants. Constant grit testing proves that SUPREME is grit-free.

Supreme
CARBON BLACK

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OIL & GAS PRODUCTS CO.
LABORATORY CONTROL UNIFORM QUALITY
GRANT BUILDING PITTSBURGH, PA.
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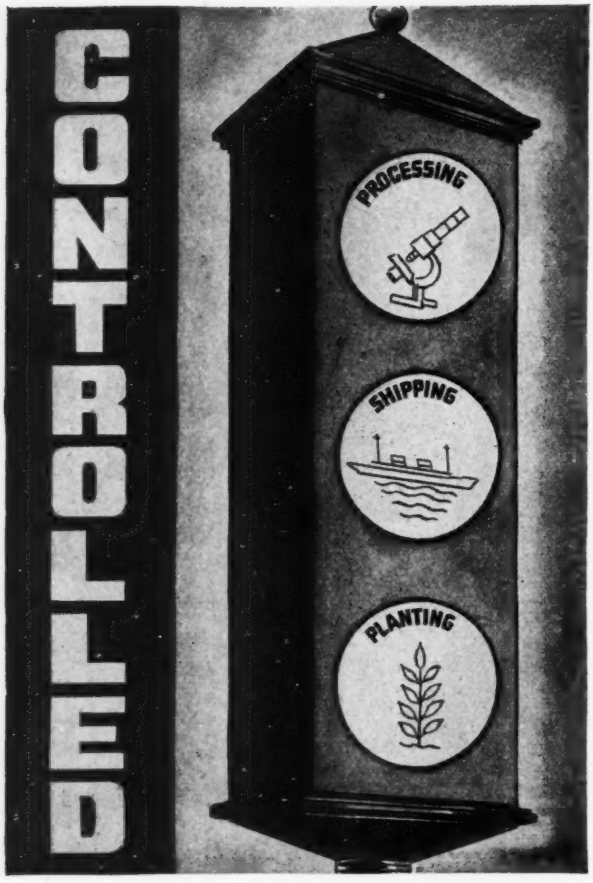

FOR YOUR PROTECTION!

ABSOLUTE UNIFORMITY is vital to the success of your products and the maintenance of your reputation! For *your* protection we assure the quality and uniformity of Latex by the rigid single company control of (1) Rubber Plantations; (2) Bulk shipments that minimize variation; (3) Scientific processing under continuous laboratory supervision. We carry stocks on hand . . . NORMAL, CONCENTRATED, and PROCESSED, for immediate delivery.

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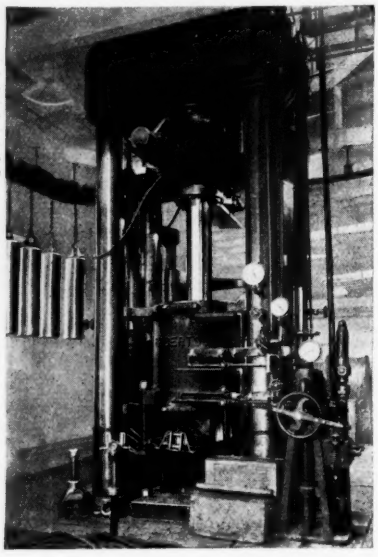
NAUGATUCK CHEMICAL

Division of United States Rubber Products, Inc.
1790 Broadway New York, N. Y.

at **SWAN RUBBER CO.**



Bucyrus Ohio

Robertson Engineered is the new 2,100-ton Lead Hose Encasing Press installed at the Bucyrus, Ohio, plant of the Swan Rubber Company.

The Press is equipped for the billet process, extruding pre-cast slugs or billets which are brought to the press on an over-head trolley, as shown in the illustration.

To drive the Press a 25-gal. High Pressure Hydraulic Pump was selected . . . a *Robertson* product, too.

These are the latest additions to this modern hose plant, and, in every respect, are the finest, most up-to-date machines developed in this field. Exclusive *Robertson* features are interpreted in quality materials and in honest craftsmanship . . . the two-fold advantages that have carried *Robertson* around the world.

Details of this equipment are fully described in literature that is yours without obligation. Just write us on your letterhead.

JOHN **ROBERTSON** CO. Inc.
127-137 WATER STREET,
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WHITE RUBBER PRODUCTS

take an 'AWFUL BEATING'!

Are yours fortified against it?

"TITANOX" pigments are well known for the whiteness and brightness they impart to rubber products. But do you know that they also give longer life by providing resistance to tearing, flexing and abrasion?

Rubber goods which must stand up under extreme conditions of service are greatly improved by the definite qualities which "TITANOX" pigments impart. Because "TITANOX" pigments are stable and non-reactive, they aid in resisting the attacks of sunlight, acids and alkalis.

Summed up in a few words, "TITANOX"-pigmented rubber products represent unmatched whiteness, brightness and durability, all of which means "quality."

Increased Tear, Abrasion and Flexing Resistance

Do you know that the anhydrite ($CaSO_4$) in "TITANOX"-C is a reinforcing filler? This characteristic may be used to advantage in many ways. For example, some highly loaded stocks contain "TITANOX"-A for color, and whiting for economy. By using "TITANOX"-C you may be enabled to replace both the "TITANOX"-A and the whiting, thereby obtaining the same color, loading and cost, with increased tear, abrasion and flexing resistance.

TITANIUM PIGMENT CORPORATION

Sole Sales Agent

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TITANOX

TRADE MARK

FARREL-BIRMINGHAM *Presents* A NEW 6" TUBER

In the design of this new 6" Tubing Machine the roller feed and other advantageous features of F-B Tubers have been retained and improvements added which increase durability and decrease maintenance.

For ease of disassembly the cylinder is made in two parts so that the forward section containing the screw can be removed without disturbing the rear section containing the driving spindle and feed roller gearing. The design of the cylinder liner provides material of maximum wear resistance at the point of greatest wear and ease of replacement.

The roller feed and constant pitch screw provide uniform pressure in the head, uniform section of stock passing from the die and less heat generation. Because the stock flows steadily at maximum speed and lower temperature, maximum output is obtained.

Externally, the machine is streamlined to improve appearance and to facilitate keeping it clean. The heavy, cast Meehanite base supporting the cylinder also contains the double reduction, herringbone gear drive. All bearings, including the thrust bearing, are the anti-friction, roller type. The motor may be located on either side as individual conditions may require.

Full particulars will be sent on request.

FARREL-BIRMINGHAM COMPANY, INC.
234 North Cliff St., Ansonia, Conn.

WHY *YOU* NEED REVERTEX

- REVERTEX has the stability you want . . . the tensile strength and adhesive quality you need . . . the economy angle you have sought.
- REVERTEX products are produced under a controlled process that brings precise, pre-determined results.
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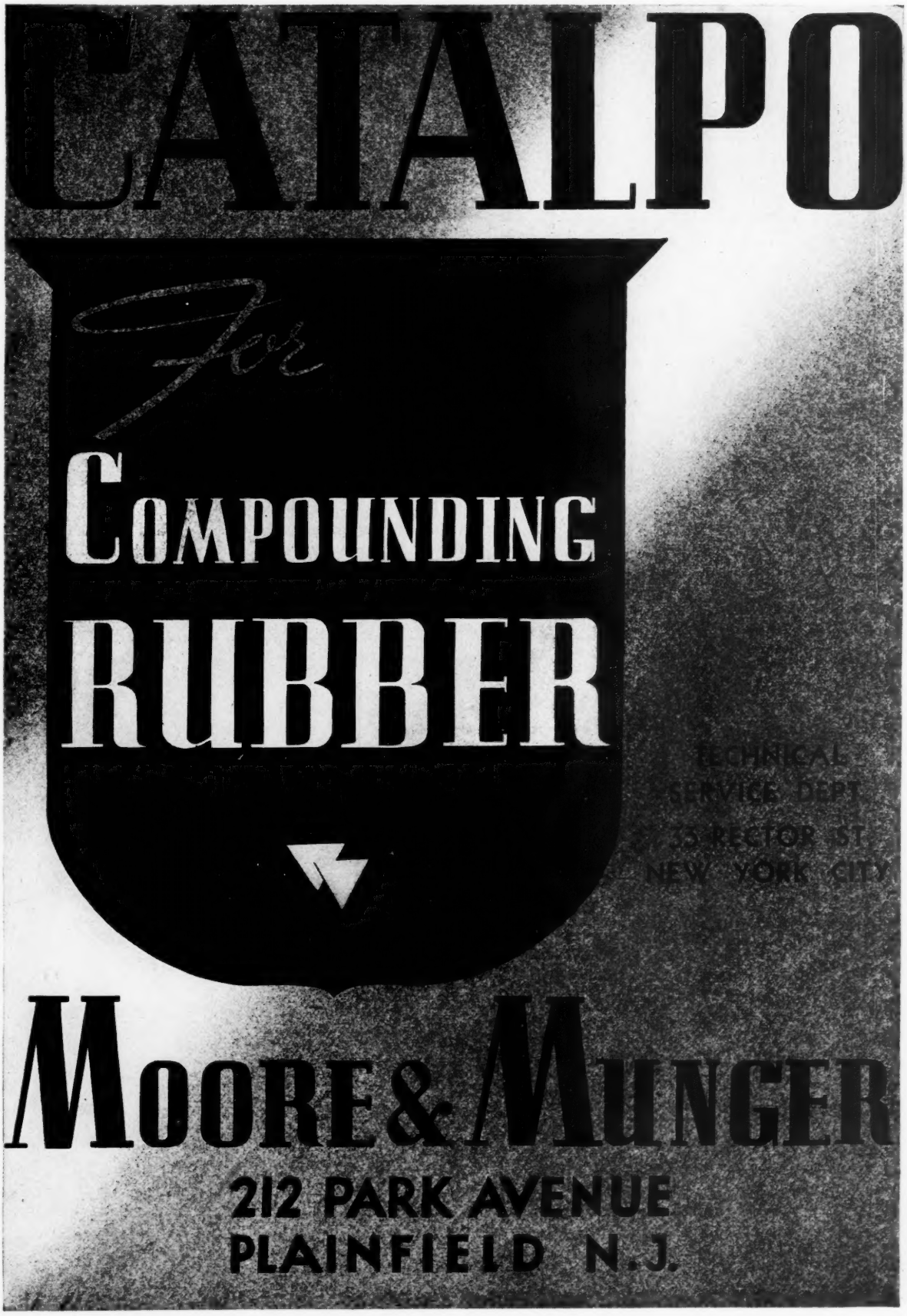
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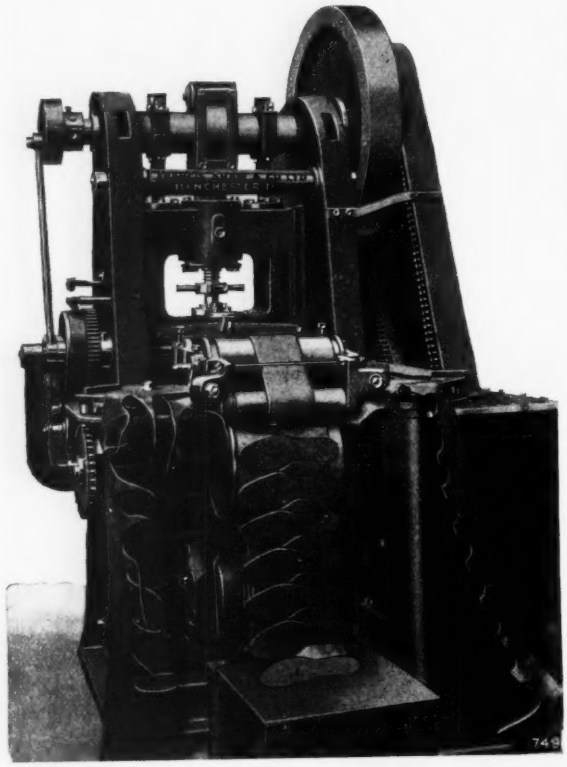

SOLES HEELS

THE VOLUMETRIC BLANKER

WILL SAVE YOU
SPEW
TRIMMING
TIME, LABOUR
AND WILL INCREASE YOUR PRODUCTION

When fed direct from a warming up machine, has a production of 100 soles or 200 to 400 heels per minute.

Have you had particulars of the Trenton Washer Placing Machine, one machine for two. Sold outright, no royalties.

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NORMAL-CONCENTRATED-PROCESSED

LATEX In The Form Most Suitable For Your Requirements

UNIFORM STANDARIZED RELIABLE

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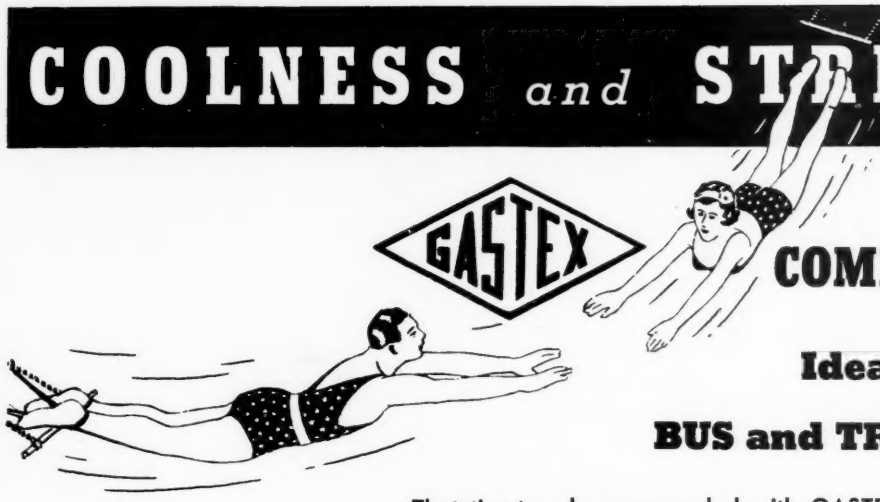
COOLNESS and STRENGTH



GASTEX COMBINATIONS

Ideal For

BUS and TRUCK Treads

That tire treads compounded with GASTEX have a lower heat build-up than other compounds is generally recognized by the industry. Tests on the Goodrich Flexometer conclusively substantiate this desirable property of GASTEX.

To insure this lower heat build-up with a maximum of tensile, so necessary to high-speed and heavy duty truck tires, the addition of channel black to the compound has been found desirable. If you are interested in the results of an impartial study made with various combinations of GASTEX and channel black, send for our new Laboratory Report No. 142. It gives full details on flexometer temperatures, normal and aged tensiles, at various cures for the following stocks:

Investigate this interesting study which shows how blow-outs may be averted and tire mileage increased. Send today for Report No. 142.

1938 10TH ANNIVERSARY 1928

	1k1	1k2	1k4	1k6	1k8
Smoked Sheets	100	100	100	100	100
ZnO	5	5	5	5	5
Sulfur	3	3	3	3	3
Stearic Acid	3	3	3	3	3
Pine Tar	2	2	2	2	2
Age Resistor	1	1	1	1	1
Channel Black	50	37.5	25.0	12.5	0
Gastex	0	12.5	25.0	37.5	50.
M.B.T.	1	.85	.70	.55	.40

Cured 20, 30, 45, 60, 90 and 120 min. at 274 degrees F.

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SIXTY WALL STREET, NEW YORK, N. Y.

GASTEX

Plants: Pampa, Tex.; Guymon, Okla.

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EVERY day new uses are being found for Vulcanized Latex. The experiment of today is the commonplace of tomorrow. Many rubber manufacturers have adopted some of the new ways of making their products by the use of Vultex and if you would know how it can be used in your plant to greater advantage, ask our technical department how we have adapted Vultex in products similar to yours. No obligation, of course.

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U. S. Patents 1,443,149, 1,682,857 and 1,939,635
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COATING
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A few uses of VULTEX

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USMC Cementing Equipment

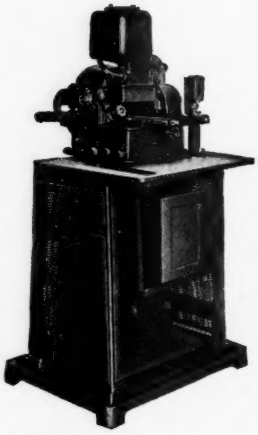
Rotary Cementing Machine Model RB

THE ROTARY CEMENTING MACHINE—MODEL RB, for cementing insoles, is motor-driven, floor type, with a capacity of 15,000 to 20,000 pairs of insoles daily.

THE USMC DOUBLE CEMENTING MACHINE—MODEL B, is especially designed for cementing both sides of rag fillers, juniors, etc. A floor machine, motor-driven, with a capacity of 12,000 to 15,000 pairs daily.

¶ The installation of these machines will enable rubber shoe manufacturers to handle efficiently their major cementing operations with appreciable savings in labor, cement, and floor space.

Machines may be used as separate units, or in conjunction with a conveyor system



USMC Double Cementing Machine—Model B

UNITED SHOE MACHINERY CORPORATION
BOSTON, MASSACHUSETTS

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Chicago, Ill.....500 South Franklin
Cincinnati, Ohio.....407 East Eighth
Haverhill, Mass.....145 Essex
Johnson City, N. Y....19 Jennison Ave.
Lynn, Mass.....525 Union
Milwaukee, Wis.....922 North Fourth
New York, N. Y.....110 Fifth Avenue
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Captures Heat Saves Dollars •

STEEL SLAB SIDE MEMBERS CONFINE HEAT WITHIN PRESS AND MOLDS

How well this new type, all-steel steam platen press meets today's requirements in rubber and plastics manufacture is best proved by repeat orders from users. For instance, one plant has purchased over 20.

The efficiency of its slab side members in confining heat within the press and molds effects substantial savings. The rugged construction, compactness, simplicity and cleanliness inherent in this design also recommend it.

Let us tell you more about this and other types of Southwark Steam Platen Presses. Consult us also about other hydraulic and auxiliary equipment you may need.

BALDWIN-SOUTHWARK CORP.
Southwark Division, Philadelphia
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Cool

Wyex Black:

COOL in processing, COOL in service. **Solve your tire-heat problems from the Banbury to heavy-duty road service by using Wyex — the *COOLEST-running black* of all channel blacks.**

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